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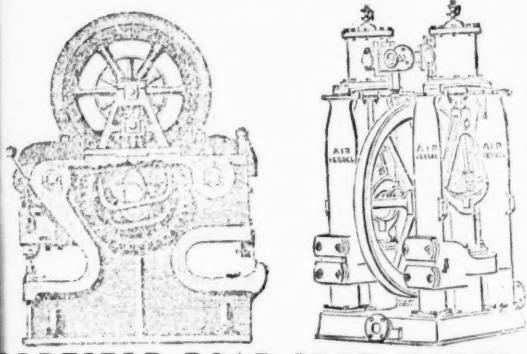
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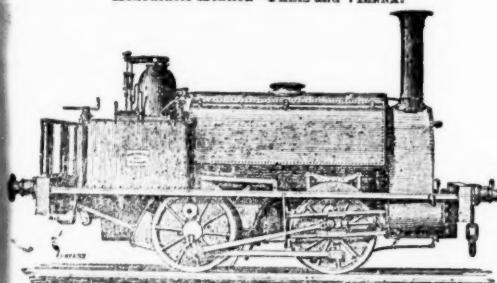
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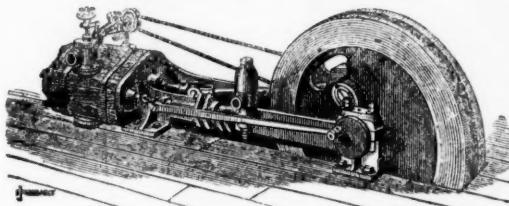
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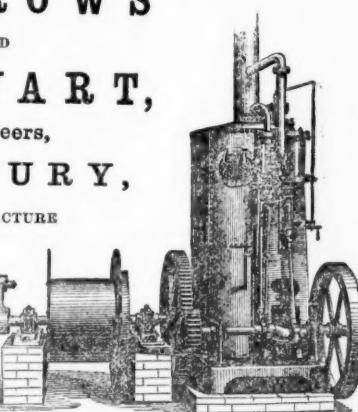
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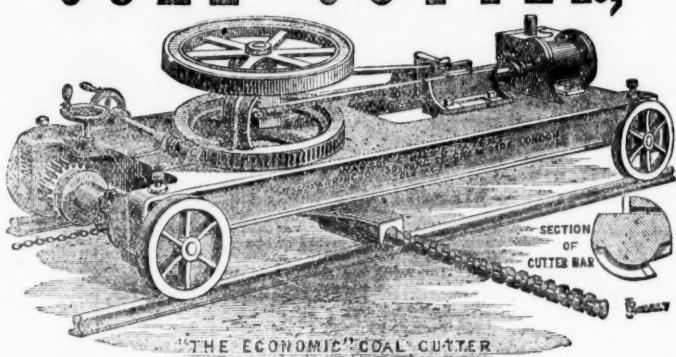
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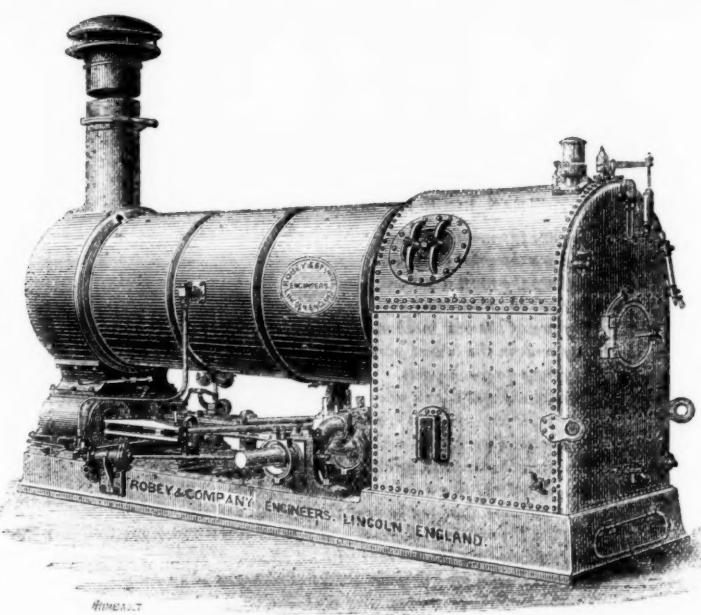
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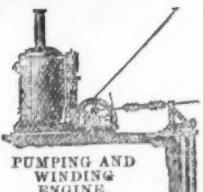
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Original Correspondence.

COLLIERY EXPLOSIONS.

SIR.—The frightful frequency and prodigious extent of these catastrophes should induce all concerned to waive their prejudiced belief that furnace ventilation is the best which human ingenuity can devise, and to listen to reason, in order to remedy this blot upon British science. I still deferentially, but confidently, aver that such explosions are preventable by means unerring—exceeding cheap and easy of adoption in any colliery; that there is no limit to its power, nor difficulty in securing its continuous and uniform action; that it will not in any way interfere with the present mode of working, nor necessitate the cessation of work for a single day in its adaptation, and that one shaft only will be found sufficient to ventilate to perfection the largest colliery in England.

To prove all this I ask no reward, but I do most earnestly supplicate all concerned in the future security of life and property in this momentous question no longer to disregard the dictates of humanity, reason, and commonsense, well founded upon natural laws and admitted facts.

In addressing through the Journal some of the most learned and scientific men of the present day, I will not waste your space with details as to the extraordinary elasticity or compressibility of the atmosphere—its expansion by heat or contraction by cold; but I must ask your indulgence to refer to a few of the important facts deposed to on oath to confirm my arguments and to condemn "Furnace Ventilation" as being inadequate to cope with the increase of danger from the immense extension of excavation, and consequent increase of dangerous receptacles for stagnant air or reservoirs of gas.

As regards the power of the furnace, the standard speed of atmospheric air is estimated at 3 ft. per second through an aperture of 40 ft. area. This would give 10,368,000 cubic ft. of air introduced in each period of 24 hours, and, supposing the coal worked to be of 4 ft. 6 in. in thickness, the contents of each acre would be equal to 196,020 cubic feet. Thus, it will be seen that when 1 acre is excavated the air may be changed 53 times in 24 hours; if 10 acres, then five times in the same period; if 53 acres, once only, or that period of time between its entrance and its exit; but if 212 acres, then only once in four days, and so on as the excavation increases. So far these figures are not denied, and the question of safety must be ruled by a given standard of mixture of atmospheric air and carburetted hydrogen, according to the productive power of the gas in various mines, which is tolerably well ascertained; and, supposing the speed of the current to be restrained to 3 ft. per second, and 10,368,000 cubic feet of air introduced in each 24 hours, it is clear that if an excess of 20 per cent. of gas is to be guarded against no more than 13 acres of excavation can be safely worked by means of one furnace; if 10 per cent., 26 acres or 5 per cent., then 52 acres, and so on, adding to acreage as the yield of gas diminishes.

It is not my purpose to call attention to the general departure from this established rule for safety; it is enough and too much to know that by means of stoppings and splitting of the currents attempts are made to limit the airways to the standard of entire excavation permissible as above stated, and, all parts remote from such main airways being disregarded, the danger is materially increased. So far this data is unquestionably true, and it is equally certain that, although a speed of 3 ft. per second can be maintained in some main airways, less than half is obtainable in the branch air passages, while all is stagnant between them. The furnace can do no more, and thus science, while limited to a class, is baffled, and our fellow-creatures by hundreds are hurried into eternity without a moment's warning.

With such awful facts confirmed by daily experience, I appeal, for the last time in the decline of life, to all in the management of such caverns of human slaughter to refresh their memories upon the subject of pneumatics. They all know from sad experience that the furnace cannot fill a pit equally throughout, that it has its limit even to an unequal supply. They one and all know that air-pressure depends upon quantity in a given space. They know, also, that if the pit can be filled to compression—say, 15 lbs. or 16 lbs. to every superficial inch of the entire area—it would effectually resist the admission of the dreaded and destructive element, which would most be forced upwards, and liberated through parts abandoned.

All that is necessary for them now is how to obtain and maintain infallibly any required degree of compressed air, capable of increase or diminution at will, with an unvaried and steady speed throughout, and this without the slightest interference with their present mode of work, and free from material cost, to ensure its general adoption, and to render safety-lamps unnecessary.

With the utmost humility and profound respect I declare as confidently as we all rely upon the rising and setting of the sun for both light and darkness that all the needed knowledge described above is fully and freely at their service. I speak not theoretically, but from absolute practical knowledge, having on Feb. 1, 1862, filled the Montague Main Colliery, which is situate at Scotswood, near Newcastle-on-Tyne, to a degree of 16 lbs. pressure to the inch with men in the pit, who expressed their delight and belief that no explosion could possibly occur with so much air in the pit as they had then experienced for the first time in their lives; the viewer concurred, and the owner, Mr. Benson, of Hexham, said he believed the grand secret was discovered, and that he would gladly adopt it, but he dared not while the closely adjoining colliery used the furnace, and its consequent diminished pressure. When these facts are more generally known I sincerely hope all former prejudices may be abandoned, as one hour would suffice to convince the most sceptical that the remedy is certain, speedy, and not only economical, but calculated to effect an enormous saving in the working expenditure.

With such a possibility in view, need I ask in vain for a strict and impartial enquiry? I hope not, particularly as it must be admitted by all that had the fatal Hartley Pit been ventilated upon this principle, and no furnace therein to consume the pent-up scant supply which was suddenly cut off, every one of the 204 human victims and many horses would have been saved. Add to this the fact that Mr. Benson kindly offered me at the time he certified to facts the use of his colliery for further experiments at any future time, there need be neither difficulty nor delay in fully testing the important question at issue.—Southdown, Farnsborough, Dec. 25. C. COLWELL.

ON COLLIERY EXPLOSIONS.

SIR.—The article on "Colliery Explosions," which appeared in the Journal of Dec. 18, is not only calculated to mislead the public, but the statements are distorted and untruthful. The writer says—"We do not desire to anticipate the verdict of the jury," yet a few lines further on the following occurs:—"There is every reason to believe that it was the result of shot firing." Probably at the time this article was written the only evidence given before the Coroner's jury was solely the identification of the bodies.

On Dec. 6 Joseph Bennett, a deputy, said in evidence that "the explosion did not occur until three-quarters of an hour after the shot had been fired," and it was the impression of the witness that the shot had done no harm, as the air was pure in the hole afterwards. On the last day of the inquest, Dec. 21, the evidence was totally against the theory of a shot causing the explosion, and this evidence was given by old experienced managers. No doubt when we come to hear the whole of the evidence, the old story, "shot firing," will be thrown overboard for the more likely theory of inadequate ventilation or defective lamps.

Being a certified colliery manager myself, I am no advocate for shot firing where safety-lamps are used. The thing to my mind is an absurdity, but I do advocate truth and facts before condemning anything, especially where so many lives have been lost.

The writer of the article is not content to anticipate the verdict of the jury, but he flings broadcast a number of untruthful statements against a body of men who are respected, and have the confidence of the majority of both owners and managers. The writer goes on to say—"The Home Secretary took the joint opinion of both the Inspectors and sub-Inspectors." From a Parliamentary Blue Book issued about August, I find that it was only the chief Inspectors

that were consulted, and that the so-called sub-Inspectors had no voice whatever in the matter.

We will now sweep the 12 junior Inspectors from the list, and fall back upon the 12 chief Inspectors. The writer says the majority of the Inspectors were in favour of using powder, but he forgets to say the reason some of them gave—that if powder was prohibited in mines where safety-lamps were used, then many managers would abandon the use of lamps, and trust to ventilation alone, hence we should have two dangers instead of one. Of the two evils choose the least, and turn our attention to the first general rule. The frequent prosecutions clearly indicate the route the Inspectors are taking—*Ventilation*.

In the *Times* of to-day is the notice of a miners' meeting near Wigan, in which they passed a resolution upholding the use of powder.

One more word for the assistant Inspectors. The writer says—"Many of the sub-Inspectors are men of comparatively trifling experience." I have made a little enquiry on this point, and find that many of these Inspectors are over 30 years old.

William Pitt was Chancellor of the Exchequer when only 23 years old. I beg the writer of the article to compare these facts with his statement, and I think he will arrive at the conclusion that he himself is a man of comparatively trifling experience, and that a liberal discount must be made either for his extreme old age or young im-
petuous.

In conclusion, I would ask your readers to withhold their judgment until the inquest is finished. C. M. M., Certificated Manager. Dec. 27.

COLLIERY EXPLOSIONS.

SIR.—The remarkable series of colliery explosions which have occurred this month—at New Tredegar on the 4th; Swaithe, near Barnsley, and Pentyrch, near Cardiff, on the 6th; Methley, near Leeds, on the 9th; and in Belgium on the 16th—points irresistibly to the possibility of some common predisposing cause having operated to intensify exciting causes, which may have been various, and to render the usual precautions for the safety of the miner insufficient. Having been professionally engaged at the Pentyrch explosion, I venture to send you a few remarks on the meteorological and other aspects of the calamity, which will also apply to that of New Tredegar, which is not very far from here. If other observers give their views and experiences of the remaining three catastrophes some community of cause may, perhaps, be discovered.

It is well known that a falling barometer conduces to colliery explosions by diminished pressure on the face of the coal. This fact will be appreciated at its full value when it is remembered that the weight of the atmosphere is 15 lbs. on every square inch of surface, the barometer being at 30 in. A rising temperature produces a similar result by increasing enormously the expansive force of the gas, which then escapes from the fissures rapidly. The great effect of heat in this way must be familiar to everyone who has ever handled a bottle containing any gas, the mere warmth of the hand being sufficient to expel the stopper; and bottles containing effervescent fluids are easily burst by moderate increments of temperature. When heat and low pressure occur together large quantities of gas are liable to be evolved in coal seams, and great danger results when the ventilation is not extremely good. The following are the meteorological data:—

Date, 9 A.M.	Barom., cor. and red.	Max. Ther.	Min. Ther.	Humidity.
3rd	29.93	39	32	78
4th	29.91	38	25	76
5th	30.11	35	29	78
6th	30.20	35	23	74
7th	30.43	37	26	72

It will be seen at once from these figures that the barometer on the 4th, the morning of the New Tredegar explosion, was about stationary, but not very high. On the 6th, just before the time of the explosion at Pentyrch, it was higher, and still rising. Deficient atmospheric pressure, therefore, could not have caused the accidents, still less could the temperature, which was unusually low on both occasions. At Pentyrch, on the 6th, the air was dry as well as cold, and a little snow was falling in small granules. It was at freezing-point, and contained 1-6th grain of watery vapour to the cubic foot. When this air entered the mine its temperature rose to 50° or more, when it was capable of dissolving at least four grains of water in the cubic foot. It would, therefore, have a drying effect, and render the coal dust floating in the atmosphere more combustible. As a matter of fact, at Pentyrch, the coal dust was fired, as shown by the coked remains on the workings, and I am informed that the deputy-Inspector of Mines—Mr. Galloway—considers that the amount of gas fired in the colliery was small, but that it ignited the coal dust, which intensified the result. Still, this could not have caused the explosion; so meteorology this time gives negative results in this locality. Although the aerial surroundings of the earth are free from suspicion, the interior of the earth itself may have led to the disasters. It is a singular fact that on the very morning of the explosions at Barnsley and Pentyrch, which happened almost at the same moment of time, there were severe earthquakes at Naples; and Prof. Palmieri reports that there were unusual disturbances in Vesuvius. The vibration of these commotions would be likely to cause an evolution of gas, and are worth the attention of observers who may send records of the explosions in their respective neighbourhoods.

FRANKLIN G. EVANS, M.R.C.S., F.M.S., &c.

Tynant, Radyr, Cardiff, Dec. 22.

ON EXPLOSIONS IN COAL MINES.

SIR.—On looking over a list of explosions which have occurred in the coal mines of England and Wales during the last 15 years, it will be observed that those in the Northumberland and Durham district stand in a much better position in freedom from accidents than those in the Yorkshire and Lancashire districts. A similar comparison has before been made by others, but I am not aware that the subject has received sufficient investigation to enable anyone to decide as to the true cause. It is well known that the Northern mines produce gas in as great abundance as those in Yorkshire, Lancashire, or Wales, but the Northern mines have an advantage naturally in the slight inclination of the coal measures, this being usually about 1 in. in a yard. The coal in Wales rises from 3 to 12 in. in a yard, which is manifestly a disadvantage when fire-damp is to be dislodged. The method of working coal, by borg and pillar, in the Northern mines, admits of thorough ventilation in the first operation of the working; in the second process—pillar working—the ventilation cannot be so complete; as a rule, most explosions have occurred at the goaf in the pillar working of these mines. The tendency of fire-damp to rise to the highest parts is guarded against by the use of safety-lamps in the whole or first working, in all cases where the two processes of working are in proximity. Indeed, it may be said that the subjects of the nature of gases, the construction of safety-lamps, and the methods of working coal and ventilating, have received careful study and investigation during a period of 15 years, much more so than in any period previous to this. The regulations for safety in every mine are carried out by properly trained and experienced overmen and deputies, or firemen; no blasting is permitted in the neighbourhood of a goaf. This contributes greatly to the good position they have attained in freedom from accidents of this character, though it is the result of dearly bought experience. Since the explosion at Burradon, in March, 1860, when 74 lives were lost, no heavy explosions have occurred in the Northern mines. The following is believed to be a correct list of these explosions:—

Burradon	March, 1860	74 killed
Hetton	Dec. 20, 1860	22 "
Walker	Nov., 1862	10 "
Coxlodge	Jan., 1863	19 "
Pelton	Oct., 1876	24 "
Seaham	Oct., 1870	4=159 killed.

Since the Hartley accident, in January, 1862—which originated in the breaking of an engine beam—and the Burradon explosion in 1860, an impetus has been given to the more safe working of collieries in this district; from the former has resulted the providing of more shafts and increased areas for ventilation. At the enquiry after the Burradon explosion the ventilation was shown to be greatly defective and ill-managed; no one would in future be likely to incur similar exposure from inefficient arrangements.

Having glanced at the principal features in the management of

the Northern mines with respect to their safe working, a list of explosions which have occurred in the Wigan district during the last seven years only is given, in which period, it may be observed, only four lives are reported to have been lost in the Northern mines—

Hindley Green	Nov., 1868	62 killed
Horley	Dec., 1868	7 "
Haydock	Dec., 1868	26 "
Highbrook	April, 1869	33 "
Haydock	July, 1869	58 "
Low Hall	Nov., 1869	30 "
Moss Pits	Sept., 1871	70 "
Ince	July, 1875	15=301 killed.

This list of accidents gives a striking contrast to the result obtained in the mines of the Northern counties in the same period. The accidents in the Wigan district, above given, were each attributed to the practice of shot firing; it would seem there is some peculiar risk and danger with shot firing in combination with the mode of working the coal in this district; it will be well if this risk has been avoided by a better knowledge of the causes operating in producing explosions. Better still would it be if mechanical appliances could be so perfected as to supersede the use of gunpowder in all mines, on which subject some hints were given in my letter of last week.

A list is given below of the explosions in Yorkshire during a period of 15 years past, the same period in which the list of the Northern mines is given—

Higham, near Barnsley	Feb., 1860	14 killed
Edmund's Main, ditto	Dec., 1862	54 "
Oaks, ditto	Dec., 1866	360 "
Ramshaw Park, Sheffield	Jan., 1871	27 "
Morley Main	Oct., 1872	34 "
Rawmarsh	Jan., 1875	23 "
Ditto	Nov., 1875	7=519 killed.

This loss of 519 lives, exclusive of the late Swaithe Main accident, when compared with the loss of 159 in the same period in the Northern mines, places the Yorkshire mines in an unenviable position, more especially when it is considered that the produce of coal in the Northern mines is considerably greater than in the Yorkshire ones. Several heavy explosions occurred in the Yorkshire district prior to this date, February, 1860, but these are not named in order to make a comparison in late years, and in the same period for each district of collieries.

The Barnsley collieries are said to be subject to sudden outbursts of inflammable gas from the strata under the Barnsley seam. These dangerous issues of gas are to a great extent anticipated by using the "Stephenson" lamp, which is the safest for such contingencies. I am not able to say whether this lamp has always proved a safe-guard in these emergencies, but it has often been reported as having acted well, on the principle of going out directly with any increase of flame in the interior. The method of working the coal, though it may be suited to the nature of the strata, does not seem to be one adapted to secure perfect ventilation; it is, therefore, worthy of consideration whether an improved system of working this coal could not be devised in place of the "bank" method of working. The causes may arise from outbursts of gas, from accidents to safety-lamps, or from shot firing and defective ventilation; in any case the remedy should be applied wherever defects can be seen.

Not having a list of the accidents from explosions during the last 15 years in South Wales, I can only say that the loss of life in that period has been great. It has disadvantages in its steep measures and bad roofs, but the ventilating arrangements prior to the period named were very lax and inefficient, which, no doubt, have by extended experience been improved upon.

I may observe that in the Northern mines a great measure of safety is secured by mechanical ventilation—about 100 of the Guibal fans are in operation, and a few others. The risk of the furnace is thus avoided, besides a more copious and constant circulation of air through the mines.—Dec. 29. M. B. G.

THE EXPLOSION AT BREMERHAVEN—DYNAMITE.

SIR.—As some very vague ideas are prevalent as to the recent explosion at Bremerhaven, permit me to point out some of the facts that have been made public. The man Thomas confessed that he had placed some clockwork inside a case containing some explosive, which after going eight days would release a hammer, causing the hammer to descend with a blow of about 60 lbs.

Dynamite has been mentioned as the explosive packed in the case; but the *Times* Berlin correspondent, whilst calling it dynamite, refers to it as a "liquid," a "frozen liquid," a "liquid crystallised by frost," and alleges that it was contained in a zinc case. If such was the case, the explosive used was not dynamite. Taking these facts into consideration, the truth must dawn upon anyone that the case was really a torpedo, ready to be fired as soon as the hammer should descend, and that it would matter very little what kind of explosive was used, any of the numerous class suiting equally as well.

The explosion occurred directly the case was unloaded off the cart—doubtless it was pitched off, and, as no clockwork will sustain a heavy shock, the natural consequence was for the hammer to descend, as the clockwork had been made on the understanding that it was to work in some factory, and, consequently, no precaution would be taken to secure the hammer against sudden shocks.

It is a well-known fact amongst users of dynamite that a detonator charge is necessary to explode this compound, for it has been proved scores of times that boxes containing only dynamite are insensitive to the heaviest shock, even though the dynamite is in a frozen state. A hammer striking one of these detonator charges will explode it, the same as the fire conveyed to it by the ordinary fuse in all mining operations. In the same manner pure nitroglycerine can be exploded; but, as this is a liquid, and not a solid like dynamite, it is usual to pack it for transport in zinc cases, the contents being poured into the hole, instead of having to be pushed down, as is necessary to do with the solid substance dynamite.

In conclusion, allow me to state that hundreds of tons of dynamite are yearly transported by road or rail, and no accident has ever happened. Blocks of iron weighing 2 to 3 cwt. have been dropped from a height of 40 to 50 ft. on to boxes containing only dynamite, and no explosion has occurred. It is unreasonable, then, to suppose that the mere shock of pitching a case off a cart on to a wharf could cause its explosion unless the case contained, as the one at Bremerhaven did, some infernal machine, with a detonating charge ready to be fired.—India-street, Edinburgh, Dec. 29. ARTHUR TUPMAN.

THE DIVINING ROD.

SIR.—This subject has been so fully discussed recently by several of your correspondents that I should not have added to the numerous communications but for the reason that I believe many may be misled by its supposed properties. You honoured me in 1864 by inserting my letter on the subject in your valuable Journal, and as I believe that letter set forth the true causes of the motion of the divining rod I think I cannot do better than ask you the favour of allowing it to appear again, of which the following is a pretty correct copy:—

THE DIVINING ROD.

"Sir.—I should scarcely have thought of addressing you on this subject had I not had good reasons to believe that there are many who really place confidence in certain attractive qualities for minerals and metals which the rod possesses, and with the view of convincing such of their error the following remarks are offered. It is not my intention, however, at present to go into the question of certain subtle attractions which really do exist in Nature, and which are partly understood by practical men, or to remark about the less familiar attraction, about which very little is known except their bare existence; but to make a few remarks on the real causes of the peculiar motions of the divining rod, which are believed to be owing to certain attractive properties it has for minerals, &c.

"The usual mode of operation with the rod when in search of a mineral vein is so well known to practical men that it needs no explanation here, any further than by barely stating it is imperative that it is held in the hands to operate. Hence the hands must either be the medium suitable to the attractive properties of the rod whereby those properties are brought into play, or they must be the direct causes of its motions. Now, I contend there are no proofs whatever that the hands are the mediums that in any way bring into action any attractions whatever, but they (the hands) are the direct

and sole causes of the motions of the rod, and that attractions from either minerals or metals have no influence at all on it—the motions it makes in the hands being simply its attempts to regain its natural position, out of which it is being held. The reason of this I will endeavour to show, as well as why it operates in the hands of one and not another.

"The principles upon which the rod turns are purely mechanical. Every operator in curving up the forked ends of the rod for an axis on which it is to turn acts upon the principle (or rather attempts to do so) of making the rod coincide as nearly as possible with a plane that would cut it at all points; in other words, that would present to the eye a straight line viewed from either side of the operator, and at right angles, supposing his hands were transparent.

"The twisting of the rod depends entirely on the deviation of the forks from the plane described. If the forks are turned so correctly as to make the figure coincide with a perfect plane, as before described, there will not be the least motion in the pointer of the rod. If a slight deviation is made from the said plane, the rod will have a weak tendency to move, for the reason that the lines of mechanical strain, extending from the forks to the pointer, are in a position to act. The angle of the lines of strain, however, is too acute to exert much force on the pointer. If the forks are curved so as to deviate yet more from the plane, the angles of line of strain will become more obtuse, and, in consequence of which, will acquire greater power over the pointer, and so on in proportion to the deviation the figure makes from the plane. In instances where the figure is made to considerably deviate from the plane the strain of the twist of the rod is so great as to take off the skin from the operator's hands.

"The above reasons account for all the motions of the divining rod, and also explain why it turns in the hands of some and not in those of others. The operator, then, that accidentally forms in curving the forks of the rod a near approach to the true plane does not understand the art of dowsing (divining), for the reason that in that position the lines of strain from the forks to the pointer have little or no power, the angles being *nil*, or too acute to exert much force. On the other hand, the operator that accidentally curves the forks so as to deviate from the said plane considerably will be a good dowsing, for the reason that the lines of strain from forks to pointer have more obtuse angles, and, consequently, exert the full force to turn the rod.—*Wenford, Bodmin, March 7, 1864.*"

London, Dec. 27. — *GEORGE RICKARD.*

GOLD IN WALES—No. XIII.

DOLGELLEY DISTRICT—CAMBRIAN SECTION.

In the Hafod-y-Morfa, or Cambrian section I propose to include the Garthgell, the Great Cambrian, East Cambrian, Prince of Wales, and the West Prince of Wales Mines.

The Garthgell Mine (Llanelyd parish) adjoins the Clogau Mine on the east, and is a little north-west of the Great Cambrian Mine. The proximity of the Garthgell Farm to these two rich gold-mines made it at one time an object of considerable attraction. It was bought by myself and ten others at a pretty heavy price, and carefully explored under the superintendence of Capt. John Parry, in the expectation of cutting the St. David's (Clogau) rich gold lode, which I had traced by trial pits on the Clogau side to within a few yards of the Garthgell boundary. I shall have more to say on this head when I deal with "The Causes of Failure in Gold Mining in Wales." There is no lack of quartz upon this property, and from some of which I have extracted gold, but the attempt by Mr. Mosheimer to extract it by means of his amalgamating pans, proved a failure, and the work was abandoned after the expenditure of 3000/- or 4000/- in explorations. Capt. John Parry wrote (1864)—

"Cambrian level driven west along the lode 18 fms.; width of lode 12 in.; cut through three or four small branches of blonde, lead, and copper ore, &c., but not enough to value. The L- or level has been commenced on the side of the river a little higher up than the engine house; distance driven, 13 fms.; lode about 15 in. thick, composed of lead, blonde, and copper ore, &c.—St. David's Level: Distance driven, 23 fms.; contains small bunches of gold now and then. I have not seen any regular lode in this level, and the ground differs from any other I saw in this part.—No. 3 Level: Distance driven about 10 fms., 5 of which are driven along the lode, which is 4 to 5 ft. wide, composed chiefly of quartz, small bunches of very good copper ore, spots of blonde, lead, and pyrites, and looks promising. I have cut some few fathoms on a lode north of the house of Garthgell, composed of hand-some quartz, spottet with copper ore, &c."

The St. David's lode was not discovered in this sett.

The Great Cambrian Mine (Llanelyd parish) is situated between the south grant of the Clogau Gold Mine and the West Prince of Wales. There are six or more nearly east and west lodes on this estate, and all of them more or less auriferous. I have myself found blonde here extraordinarily rich in gold, and narrow strings of quartz in soft clay-slate, accompanied by more than an equal quantity of gold. "The shoots of gold were sometimes far between," and possibly few. I found, also, acicular crystals of rutile in the quartz. I never held a share in this mine, and, therefore, received no official reports. I find, however, that Capt. J. Parry (1862) writes—

"No. 2 lode is kindly looking, and yields gold by amalgamation. No. 3 lode, a few fathoms north of No. 2, is about 3 ft. wide, composed of lead, blonde, quartz, pyrites, copper, gold, &c. The stuff will yield gold by being pulverised and washed. No. 6 lode (the Cambrian gold lode) is not very regular one, sometimes being 5 ft. wide; at other times very narrow. Splendid visible gold can be seen in the lode. I saw myself magnificent specimens broken down from the back of the level."

Capt. Wm. Pascoe writes (1862)—

"No. 6 lode will produce 5 tons of quartz to the fathom, about 1440 tons, some of which is rich in gold."

Beautiful samples of the gold ore were in the International Exhibition of 1862.

Mr. John Culver wrote and published in the *Mining Journal*—
"Enclosed you have the result of assays from 235 lbs. weight of quartz, broken down from several places, extending over 3 fms., on No. 6 lode; and likewise my assay of 2 lbs. weight of blonde, taken by Capt. Hogan from 22 tons of blonde, now ready for sale on the mine. The blonde produced at the rate of 16 dwt., 12 grs. of fine gold to the ton. After breaking the quartz into pieces of about 2 in. square, I divided the whole quantity into two parcels—one showing gold, the other no gold visible to the naked eye. The first parcel weighed 14 lbs., and produced at the rate of 168 ozs. of fine gold to the ton. The second parcel weighed 2 cwt., and produced at the rate of 5 ozs. 10 dwt. of fine gold to the ton. The first parcel will be above the average of that part of the vein from which it was taken, while the second will be below. So long as the No. 6 lode continues to produce ore equally rich, there is no doubt it will pay to work by almost anybody's process; for if only one ninth of the gold should be extracted, and the other eight parts wasted, like they do at the Dolfrywyrn Mine, &c., still it will leave a profit, after paying all reasonable charges for raising and dressing."

Mr. Josiah Harris shortly afterwards wrote—

"Having received instructions from the committee to take from their gold lode 10 cwt. of auriferous quartz, for the purpose of testing its commercial value, I have much pleasure in forwarding you, for the benefit of those interested in the question of gold in Wales, the result of my trials, with some remarks upon the same. The lode from which the 10 cwt. of ore was taken is called No. 6, running east and west, about 4 ft. wide, and is hard white quartz, with strings of clay-slate and iron pyrites disseminated through it. A level has been driven on the course of the lode, and has laid open the north side of it for about 20 fms.; 4 fms. from the forepart gold is distinctly seen here and there in strings of quartz, of about $\frac{1}{4}$ in. in width, with clay-slate on each side. At 3 fms. from the forepart, on the north side of the lode, 10 cwt. of ore were broken down, showing gold in many places. I tried it in three ways—by smelting, by amalgamation, and by washing. The result given by smelting was 3 ozs. 5 dwt., 12 grs. of fine gold to the ton of un-refined ore; by washing, after being crushed to an impalpable powder, 3 ozs. 1 dwt. 17 grs. of fine gold to the ton of ore. To test the correctness of the foregoing results, I assayed the ore, and found 3 ozs. 5 dwt., 14 grs. of fine gold to the ton. From the character of the ore, and the gold being unassociated with any other metal (a little silver excepted), there was not the least difficulty in separating the gold, both by chemical and mechanical means. Although the results are so favourable, I do not believe the whole of the lode, if taken down from wall to wall, would give so good a result; at the same time, I think there is a certainty of its being found in paying quantities."

Mr. Calver's assays of ore from the same lode, inserted in last week's *Journal*, being so widely different from those I now give, I take the opportunity of saying that I am surprised the result of his assays did not give a much larger return, considering that the 235 lbs. of rich visible gold ore was broken down from many places, showing gold, and extending over 3 fms. It is possible to bring up assays to any amount. I have this week, from picked stuff, from the same lode, obtained at the rate of 430 ozs. of gold to the ton of ore. To parade such and similar results before the public as averages of the ton does harm, is deceit, and brings me into disrepute upon the subject."

Capt. Martin and W. H. Pascoe reported to the directors of the Cambrian Company, Oct. 21, 1865—

"The following is a report of the work done in this mine since March 3 last, when we were authorised to pursue our explorations on the No. 2 lode, for a further period of six to eight months, it being our opinion, as well as that of Mr. Dean, that indications existed of such an encouraging character (accompanied sometimes with visible gold in the No. 2 lode at the No. 2 shaft) as to justify us in strongly recommending a further working, to enable us to cut the lode further east from No. 2 shaft, and also to sink it upon it until we arrived at its junction with the slate, as shown in the drawing by me at the last meeting. This work was carried out, but instead of finding, as anticipated, a concentration of ore near the intersection, the junction has had a contrary effect, the lode becoming disordered, very little mineralised, and

less gold disseminated through it: in fact, the appearance of the lode and the surrounding rock in this place, we are sorry to say, has turned out very unsatisfactory, and not so congenial as nearer the surface. Under these untoward circumstances we do not consider it advisable to recommend that further operations should be continued, and all work has accordingly been stopped. The company hold, besides the Cambrian Mine, the Hendreforfa, North Vigra, and Wellington sets."

The Lydia lode, in the North Vigra sett: "We have to report that our operations were confined to May and June, the cost incurred being 15/- 16s. This was expended in drawing the water, clearing the old workings, and driving about 2 fms. east on the lode, when the appearances at the bottom not warranting us in sinking further, workings were stopped. Trials of the quartz were made in the Britton's at the works, and assays taken, and we regret to say that the results of both processes were unsatisfactory. Driving and sinking since last meeting:—

No. 6 stope, west of shaft	Fms.	4	0	0
2 lode, east	...	3	1	0
2 shaft	...	2	0	1
2A, east of No. 2A shaft	...	11	2	7
2B lode, east of No. 2B shaft	...	17	5	4
3m. winze	...	7	0	2
2B, west of winze	...	2	0	0
2B cross-cut, north of No. 2 lode	...	7	3	0
Lydia lode (N. Vigra)	...	2	0	0

Total amount of ground... Fms. 57 0 2

In addition to the above workings we should mention that since the last general meeting we have thought it our duty to co-ordinate and make trials on the banks of the different lodes in the company's sets, but we are sorry to report without meeting with ore sufficiently encouraging to proceed further. We trust you are satisfied that nothing has been wanting on our part to carry out the orders of the directors, and to promote the interests of the company, and we regret much that our endeavours have not been attended with the success we counted upon."

This company was a favourite on Change. According to the balance-sheet up to Aug. 31, 1865, its expenditure had been 14,394/- 16s. 8d. It had 11,000/- cash out at interest, and a total balance in its favour of 16,180/- 19s. It had received 2074/- 4s. 4d. for interest on loans, and 75/- 17s. for transfer fees! Receipts on sales of gold, *nil*!

I may observe here that the gold associated with blonde is extraordinarily fine—so fine, indeed, that it would float upon the surface of water. After a particular test-operation by an eminent mining engineer, now deceased, I collected an appreciable quantity of gold from the surface of the river, near the bridge, by means of folds of blotting-paper. Some of the ore of this mine was as rich as any found at Clogau. On one occasion (in 1862) I was courteously allowed to examine the mine, and to take the best specimen I could find. I did so, and a portion of that specimen may now be seen at the British Museum. On another occasion, being near the spot, I was allowed to accompany a party just come down from London to inspect the mine. Some of us, duly candle, entered one of the levels, which was very wet. Those most interested peculiarly went in first. A gentleman strange to me, with patent boots and tight garments of exquisite build, extravagantly bejewelled, and smoking vigorously a gold-mounted meerschaum, preceded me, picking his way upon tip toe, and solemn J. P. brought up the rear. After a few yards of back-bending, too irksome for an exquisite, our Nabob suddenly fell out of file, and sat himself down upon a little cask he saw there in a sitting, declaring, with sundry forcible expletives, that the gold might remain where it was, or go to some other place if it liked for aught he cared, and that he would stop where he was till we came back. "Better not sit there," observed J. P. "Why not?" drawled out the exquisite. "Because," said J. P. very deliberately, "Because 'tis pooder!" True enough, and the head of the cask was half off. Like a shot our friend went out at the mouth of the level, and I never saw him afterwards. On this memorable occasion there certainly was plenty of gold *in situ*. What became of it I never heard.

Extracted from the directors' report, Nov. 9, 1865:—

"At the annual meeting, held on Feb. 17 last, your directors informed you that Capt. Martin, the mining captain, although he did not up to that time realise the expectations which were entertained by him, still had a strong opinion as to the ultimate success on No. 2 lode, if he were allowed to pursue his explorations for a further period of from six to eight months, inasmuch as he believed that he had evidence of rich underlying shoots of gold out of the line of the then existing shaft. Your directors, therefore, acting under this advice, and fortified by the report of Mr. Arthur Dean, C.E., considered themselves justified in recommending to the meeting that the works should be continued for the above named time, consequent upon your approval of the same. The workings on No. 2 lode were carried on in the most energetic manner, notwithstanding the interruptions owing to the long drought, but your directors regret to say without the success expected. They have, therefore, in accordance with your resolutions, abandoned further operations. The directors also informed you that they had secured the option of purchasing a property on reasonable terms, which they were informed had been proved at surface for a continuous distance of 14 fms., to carry ore containing from 1 to 2 ozs. of gold per ton, and recommended you to authorise them to take measures to secure it, provided their information after a fair trial proved to be correct."

The above property was laid open at various points, and some of the ore brought to and treated at your works, but the lode was not found to promise so well throughout as the very favourable indications at the surface had led the mining captain and your agents to expect; your directors, therefore, declined to complete the purchase, deeming it better not to incur further outlay unless on the most positive evidence of good results being obtained. It may be added that several other properties have been offered to them, represented as very valuable, but which on investigation they considered it advisable to decline. Under these circumstances, your directors have called you together to consider the report of your mining captain, which they deeply regret fail to realise the hopes and anticipations entertained. These were originally founded on the reports of Messrs. Thomas Treloar, Capt. Parry, and others of great experience in gold mining, corroborated by your mining captain and agents, and also on the great results which had attended the mining operations for gold in the neighbouring property of Vigra and Clogau. Finally, taking into consideration the different facts mentioned above, your directors suggest the propriety of taking immediate measures to dissolve the company."

The company eventually went into liquidation with a large cash balance in hand!

The East Cambrian Mine, called also "Imperial" and "Standard" (Llanelyd parish), situated at Moel Yspri, in the Hafod-y-Morfa Mountain, is about 3 miles north-west of Dolgellau; bounded east by the Sovereign Mine, west by the Cambrian Mine, and south by the Prince of Wales Mine. There are several east and west lodes, one of which is described in a prospectus as "a monster gold lode, in places 30 ft. wide, running through the property." In the opinion of Septimus Bardinmore, M.E., "the most important lode would appear to pass

right through the Cambrian and Garthgell sets." The late John H. Clement, F.G.S., wrote, "I have always considered the mines in Moel Yspri as being placed in lodes that will return large profits to adventurers in gold, silver, and lead." He mentions five distinct lodes as being in the Lower Silurian formation, with here and there, in the range of these mines, protrusions of greenstone, also felspathic ash, so *prolific in utility* during the *deposition of metals*." Mr. Clement expressed his opinion in 1846, 1858, and in 1862, "that on this property 50 fms. of depth should be reached before abandoning hope of success." Capt. Thos. Faull wrote (1862), "that in 1830 he opened some pits here, and got specimens of rich silver-lead ore." He refers to "the opinions and views of able writers" as to the existence of gold thereon. Capt. John Parry (1860) wrote of one of the lodes as "a magnificent one running east and west for a long distance, and very promising for silver-lead ore and blonde;" also of a sulphur lode, spottet with copper, 12 feet wide. He did not allude to gold. Finally, taking into consideration the different facts mentioned above, your directors suggest the propriety of taking immediate measures to dissolve the company."

For my own part, I think Mr. Probert is worth to the mine more

than Mr. Rickard and all the old gentlemen of the board put together, and that he will not advance money for dividends until the debt is considerably reduced, which is not likely to occur so long as the mine is muddled by Rickard and the old gentlemen in Coleman-street. Let Mr. Probert manage the mine in Nevada, let us have an agent on this side to receive and issue reports, and my hopes would rise. Shareholders in mines are to a certain extent gamblers, and we must not be too rigid in our judgment of the actions of those who manage a gambling business."

SHAREHOLDER.

THE RICHMOND CONSOLIDATED MINING COMPANY.

SIR.—The explanation given by the Chairman of the Richmond Mining Company with regard to the September circular, which stated that the September interim dividend was only postponed in consequence of the San Francisco panic, was that the board were mistaken in their calculations—i.e., the board thought that the mine had in three months earned a net reserve of 20,000/-, which it had not done. This was the miscalculation of men whom the shareholders have blindly accepted the valuation of in the "shaped" reports which they adopted at the meeting. I can fully sympathise with the shareholders in their decision, for the market value of the shares depended on their supporting the board. The board stated that the company had paid three dividends in the year ending Aug. 31, 1875. Such is not the case. The dividend paid Dec. 1874 was paid out of the credit balance at the end of the year, Aug. 31, 1874. The only dividends we have received out of this year's revenue are the 5s. dividend paid March 1875, and the 7s. 6d. dividend paid June, 1875, consequently the mine has paid 12½ per cent. dividend for the year ending Aug. 31, 1875. The 7s. 6d. proposed in the report to be paid "at the earliest possible date" will not, I submit, be paid at all, for the Chairman told us that the bullion agent wished his debt to be reduced—in other words, he has lost confidence in the mine.

Unless we raise 50,000/- by debentures (though how that is to be done is not clear) we have no chance of getting a dividend for some time to come. I fully believe Mr. Aston's statement regarding the cablegram (from Mr. Probert to some anonymous friend), that we shall have no dividend before next summer, and that even then it would be problematical. Mr. Bridgewater told us that Mr. Probert corresponds with him about the mine, but Mr. Bridgewater only told the shareholders that which it was agreeable to hear, consequently no objection was raised. Had the cablegram referred to revealed good news there would not have been any opposition to it. Whence the difference between sending information by letter or by cable? Is Mr. Probert debarred from communicating with his friends? Mr. Probert will tell us that the board has the same information.

For my own part, I think Mr. Probert is worth to the mine more than Mr. Rickard and all the old gentlemen of the board put together, and that he will not advance money for dividends until the debt is considerably reduced, which is not likely to occur so long as the mine is muddled by Rickard and the old gentlemen in Coleman-street. Let Mr. Probert manage the mine in Nevada, let us have an agent on this side to receive and issue reports, and my hopes would rise. Shareholders in mines are to a certain extent gamblers, and we must not be too rigid in our judgment of the actions of those who manage a gambling business."

THE RICHMOND CONSOLIDATED MINING COMPANY.

SIR.—The real profits of the Richmond Company for the last half-year must be in excess of that appearing by the accounts, and this additional amount will be credited in future accounts. I give my reasons for this statement. The mining expenses for the half-year ending Feb. 28 were \$167,917; for the present half-year \$135,941. The furnace expenses for the same period were respectively \$329,224 and \$299,510; hence the working expenses on mining and furnace accounts are in the aggregate about \$71,000 less than in the previous half-year. The gross assay value of bullion for the half-year amounts, according to the statement, to \$985,606, as against \$1,112,520 for the half-year ending February last. And here I may note that if the furnaces had not been shut down during the last half-year for one month in consequence of the winter the returns for the last half-year would, if those four weeks averaged the same as the remaining weeks in the half-year, have exceeded the return for the previous half-year in the ratio of about \$1116 to \$1112, inasmuch as we have gained on the working accounts before named, by the reduction in expenses \$71,000, and the difference in the returns for the two half-years amounts to only \$124,000, the variation in the amount of profit for the two half-years on the mining and smelting department is only \$54,000. As the accounts show it to be \$238,000, there remains a deficiency of \$184,000 to be accounted for, and this the accounts show arises as follows:—The three other items in the balance-sheet for the half-year ending Feb. 28, 1875, deducted from the profits are, fluxing ore purchased, general expenses, and interest to bullion agents, which in that balance-sheet amount in the aggregate to \$70,000. The same items in the present balance-sheet amount to \$99,000, showing an increase of \$29,000, and this reduces the deficiency of profit between the two balance-sheets from \$184,000 to \$155,000; hence, if the balance-sheet for the present half-year were made out in the same manner as the balance-sheet for the previous half-year, the profit would be nearly double that which is now represented. How is it this profit does not appear? We find items introduced for the first time in the present balance-sheet with regard to the refinery—\$62,000 refining expenses, \$56

half-year, being the first year of the company's refining. By the next half-year the refinery will have turned round and realised a half-year's returns, and then we shall find our profits will appear at their full amount.

I advise every shareholder to take the two balance-sheets, and follow my letter, and they will see for themselves that what I say is correct. I intended explaining this at the meeting, but its inordinate length and the difficulty of explaining figures concisely in a speech prevented me.

A SHAREHOLDER.

RICHMOND CONSOLIDATED MINING COMPANY.

SIR.—According to the report of the general meeting, which appeared in your last week's Journal, the following statement was made by Mr. Aston:—"Shareholders would not receive any more dividends between this and midsummer, and then they were problematical. These were Mr. Probert's own words, conveyed in a telegram to a friend of his, and received only last Friday." To this serious allegation the Chairman promised "to institute enquiries as to its incorrectness." Mr. Aston added—"He would be glad to give 100/- to a charity if his statements were proved to be incorrect."

What I wish to ask is—Has the Chairman kept his promise, if so, the board must have had a reply? Why, then, have shareholders not been made acquainted with it?

Again, rumour says that the bullion agent is still owed 50,000/- exclusive of the ore on the dump, which, although included as an asset in the accounts, really has been advanced upon by the bullion agent, who has refused to make further advances until more bullion shall be produced.—Dec. 28.

ONSEVER.

NEW QUEBRA COMPANY.

SIR.—Having for many years past been largely interested in the above company I have hung on, feeling confidence in the result, as our affairs, after such a series of blunders, got into the hands of directors who would go earnestly, honestly, and energetically to work. This at length we appear to have obtained, and I think I may congratulate myself and those fellow-shareholders who have acted as I have done in the prospect of our patience being early and amply rewarded.

I was glad to find about three months ago that a gentleman was going out in connection with the works, from whom I felt sure that I should be able to procure reliable information, and I consider that which he has sent over after a month's residence there as very satisfactory. He says that although there have been really no what are termed "engineering" difficulties, still that the contractors have had very great ones to contend with in the first long wet season in the want of roads of any description by which materials could be sent in advance of the railway, and the scarcity of local population, so that they had to seek their workmen from a distance, who left at intervals to look after their own little clearances, and from the effect of climate on their European skilled workmen, but that this was improving, and would improve still more as the country got more opened.

All these circumstances combined had rendered the progress somewhat slower than originally calculated, but that he thought, on the whole, that it was very satisfactory. He speaks particularly of the bridges, of which there is a large number, mostly of iron, and some very long, as being well designed and admirably constructed, and such as would do no discredit to the best lines in Europe. He says, moreover, that he sees no reason why the railway, although not absolutely finished, should not be in fair working order during the coming summer.

It appears from him that the superintendent at the mines is very chary of giving any information to outsiders, but that it had oozed out through some of the miners that they had recently come upon a very rich lode of ore at a spot where it had been expected. This, no doubt, is what the directors alluded to in the little circular they sent out with the report of the last half-yearly meeting, and in my opinion is eminently satisfactory.

If these circumstances were generally known I cannot conceive why our shares should remain at their present low price. About two years ago, when the railway was first started, and it was known would take at least that time to make, our shares were at 5/-, yet now that it is really within a few months of being opened, and we have in the meantime received ample confirmation of the quantity and quality of the ore to be obtained, which we were then without, the price is only about 4/- I cannot understand this, but must leave it for time to elucidate.

AN OLD SHAREHOLDER.

SEPARATION OF MINERALS.

SIR.—The separation of mixed minerals appears to be the next great question for public discussion through the columns of the *Miners' Journal*. Mr. Ellery seems to think the matter very insignificant, so much so that he says hundreds of boys in Cornwall under 15 years of age can perform the work satisfactorily—separation of lead ore, blende, and copper ore. Mr. Sewell, in the Supplement to last week's *Journal*, thinks otherwise. Whilst admitting that lead ore can be separated from blende, copper ores and iron pyrites, he argues—and that very reasonably—that the latter three minerals are very difficult of separation, owing to the specific gravity being about equal. There are thousands of tons of these ores in Cornwall considered worthless, and any process, whether mechanical or chemical, which has for its object the separation of these minerals with commercial advantage should have at least a trial given it, so that the merits and demerits of the affair might be discussed. I know of several mines containing mixtures of blende, lead ore, tin ore, copper ore, and white and yellow muriatic, intimately associated with each other. If your numerous scientific readers will come to the front, and give their views on these matters, I feel assured they would be conferring a boon on the public at large, and on

ONE INTERESTED.

WHEAL GRENVILLE.

SIR.—I have only just seen the *Journal* of Saturday last, having been absent from town; and I have neither time nor inclination to wade through Mr. Clift's letter and legal quotations. And there is the less occasion for me to do so, because all the writing in the world, legal or otherwise, will not alter the plain and simple fact for which I have contended—that both by law and custom a resolution passed at a special meeting of shareholders must be confirmed by a resolution passed at another meeting specially convened for the purpose.

Dec. 30.

ARGUS.

WHEAL GRENVILLE.

SIR.—Mr. Clift, who confesses himself the hired advocate of the new management of Wheal Grenville, seems to argue upon the general assumption that a public writer can only write for personal or interested motives, and asks "Who is 'Argus'?" But it seems to me the question is not "who is 'Argus,'" but has he given us advice that we should have done well to follow; and are the very difficulties he foretold closing round us? When I see a property depreciated many thousands of pounds in a few weeks, I confess to some anxiety, and shall look forward to the meeting on Thursday to afford some slight relief to— A GRENVILLE SHAREHOLDER.

[For remainder of Original Correspondence, see to-day's *Journal*.]

THE WEST CORNWALL ANNUAL AND ALMANAC.—The two little books just published by Mr. J. S. Doidge, of Redruth, under the titles of "Doidge's West Cornwall Illustrated Almanac" and "Doidge's West Cornwall Illustrated Annual" respectively, are really marvels of cheapness, and should be at once procured by every Cornishman, whether resident in the country or elsewhere. The one is an enlargement of the other. They contain an interesting Christmas tale by the writer of "History of Redruth and Neighbourhood," &c., a mass of local information, including a list of mine pays for 1875, the names of the copper companies and their cashiers, assayers, and samplers, the dates of copper ore ticketing and places of sale, the West Cornwall classes of the Miners' Association, places where held and day of week when held, and tide-tables for Cornish ports for 1875. They are also a directory to the places of worship and their preachers, to the county court, to the public conveyancers, &c. The price of the almanac is only one penny, and eight thousand have been printed. The annual, in addition to the information contained in the almanac, gives a number of blank pages for diary and memoranda.

Royal School of Mines.

PROF. SMYTH'S LECTURES ON MINING—No. VIII.

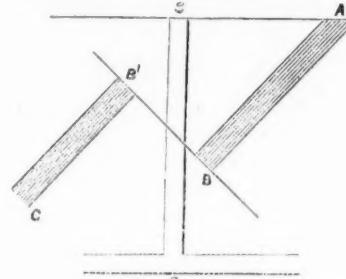
[BY OUR SPECIAL REPORTER.]

With regard to the nature of lodes, we have seen that in the best known districts we generally find series of lodes well marked in their character, each series differing from the others in certain points. As exceptional cases we may find veins running in very different directions from the others, but nevertheless bearing the same minerals; as, for example, in the Duchy of Nassau and in Siegen. In these districts there are lodes running, as in the North of England, a little N. of E., and a little S. of W., and others running at nearly right angles to the first, nevertheless both yield magnificent ores of iron and ores of lead. And in the Isle of Man we have a fine lode coursing E. and W., and producing lead rich in silver, and another equally as good coursing N. and S. But usually some difference can be noted, as in Siegen and the Isle of Man, and Alston Moor; for example, as a general rule, the N. and S. lodes are apt to be very bunched and unequal, and this is notably the case in Siegen.

We come next to a portion of our subject which from very early times has thrown great difficulties in the way of the miner—the subject of dislocations or heaves. It has not been till within the last few years that accurate opinions and reasonable hypotheses have been brought before us on these matters; and if we go back only as far as the last century we find a great deal of vagueness in the writings, and this we can trace back even to the time of Agricola, who wrote on this subject in the middle ages. Agricola saw clearly the disturbances were frequent in those districts where the lodes do their best; and he found that in some cases where lodes crossed at right angles the two were fused together at the point of intersection, in other cases one lode ran right through the other. But more commonly one lode was found inclined to the other, and then it occurred that one of them was disjoined, or heaved, so that to find the other part of it you must go in a certain—or rather an uncertain—distance. This displacement may likewise occur with lodes intersecting at right angles. Agricola also observed that if there were a break the lode would be found again on the side of the larger angle. Then a large number of authors, especially German, wrote on the subject without making it much clearer, kept back by the peculiar views on geology held by the Wernerian school. Werner himself, who wrote a treatise in 1791, saw that these veins must have been the result of the dislocations of the rock masses. Schmidt, who wrote in 1810, was the first to put forward clear views on the subject, and since then the numerous observations recorded in the "Transactions of the Royal Geological Society of Cornwall," and in publications issued at Freiberg, more or less corroborate the views of that author.

We will first pay attention to these heaves considered in a perpendicular and then in a horizontal direction. And we will take a case which occurred a few years ago in the copper mines of Knockmahon, in the county of Waterford, Ireland. This is illustrated in Fig. 6, where A represents a portion of the lode discovered at the

Fig. 6.



surface by surface trenching, &c. A shaft was sunk, as at S, for the purpose of intersecting the lode as usual, but they went down for some distance beyond the point at which they ought to have struck the lode, finding nothing whatever of it, nor could they find it in the galleries on either side at D. Why was this? They had not observed in sinking the shaft a little thread (B B') which passed through it, coursing in the same direction as the lode itself, but dipping in the opposite direction. This lode was, in fact, a heave, which carried the broken part of the lode to B', where it was subsequently found and worked. It shows us the necessity for noting carefully every such appearance which looks different from the ordinary joints of the rock. It was a false idea of the early miners that this sort of dislocation would be produced to a greater extent by a thick mass of hard material, and some of them went so far as to say that the stronger vein in point of hardness would dislocate the other. We may, I think, come to the opposite conclusion, and the miners will say that it is flockan which has the greater power—in other words, it is a joint of more recent character, accompanied by clay. The simple mode we have of determining where the continuation of the lode lies is that the broken point of the lode is lower on the side of the hanging wall of the dislocator, as will be seen in Fig. 6, where the lower point, B, of the broken lode is on the side of the hanging wall of the dislocator, B B'. This is, in fact, the same rule which I mentioned to you in the case of stratified deposits. To this rule, however, as was the case with the beds, there are exceptions; and after paying great attention to these exceptional cases, I think I may say that where they occur the slide is an extremely flat one. In, perhaps, 49 cases out of 50 the general rule holds good, but we must be prepared to meet with exceptions.

Fig. 7.

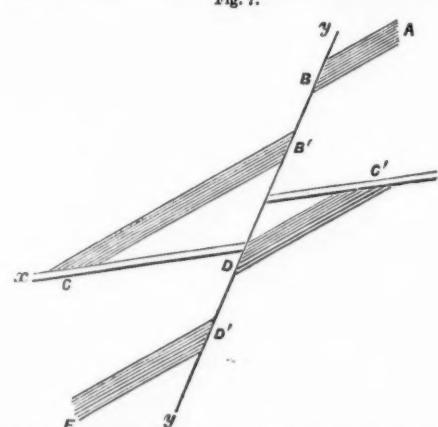


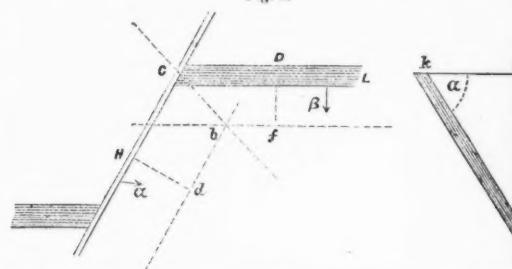
Fig. 7 is an illustration of a complicated set of phenomena due to the combination of two heaves of different periods. The lode, A B C D E, was originally one continuous lode; it was then cut through and dislocated by the vein (x), and subsequently the separated portions of the lode, as well as the previous dislocator, were again displaced by a second dislocator (y), so that the originally continuous lode is now cut up into four limbs. This case occurred in a mine on the south flank of the Carpathians, in Hungary.

The district of St. Agnes, in Cornwall, where the lodes of tin are generally very flat in their underlie is one where a great number of these dislocators frequently occur, and almost invariably have the effect of heaving the lode, and there are instances where one lode has in this manner been brought to the surface two or three times: these dislocations are locally termed gossans. There are, again, other

districts where such complicated phenomena are unknown. A cross vein intersecting a lode may displace it only to the breadth of the lode, or even less, so as to leave mineral on each side, or it may displace it several feet or fathoms. I do not know that there was ever a mine opened in the world where such a complication of these phenomena can be seen as the copper mine of Knockmahon. In the Museum above you will find an interesting model of Holmwood Mine, in Cornwall, showing some of these phenomena very distinctly.

On coming, then, to one of these dislocations the question is—Which way shall we turn to discover the lost lode? We shall find various rules in various districts; some will tell us always to turn to the left hand, others to the right hand; some on one side of the greater angle, some on the side of the smaller. This occurs simply from the fact that the miners in each district have observed what has been the most successful method in their own district; but the variation shows us that it is desirable for us to have some more definite rule. Such a rule was first propounded by Schmidt, and to this we will turn presently. The cross-course receives different names in various parts of the country—as flockan, spar courses, cross-courses, trawns (from the Latin *trans*), and guides, because by following them along they serve as guides to meet with veins which come into contact with them. They are filled with clay, quartz, iron ores, lead ores, &c. The lode on the hanging wall has slipped, as it were, down the plane, or the relative movement of the sides has been equivalent to that, and in the case of an inclined lode this downward movement has the result of shifting the lode horizontally at a given spot; when, therefore, the miner comes to the cross-course it is necessary that he be able to determine in which way to work in order to fall in with the lode again. The simplest way to get at the solution of this problem was proposed by Schmidt, and it is far more satisfactory than any we could get in a district as to right hand or left hand, small angle or large angle; and there can be no doubt that it is the result of philosophical conceptions of the nature of the movements which have taken place in the ground.

Fig. 8.



Let us take the case of a lode, L, running east and west, as in Fig. 8, and intersected by a cross vein, x, and let them be laid down as in figure in our mining plan. We have first to determine the line of intersection of the two planes—the plane of the lode and that of the cross-course. It is important to determine this for two reasons—first, because we very frequently find it to be a line near or along which a run of rich deposit is likely to be met with; and, secondly, because it helps us materially in the solution of our problem. For this purpose it is necessary that we make out the strike and dip of both lode and vein, and indicate them on our plan, the dip being represented in direction by the arrows. We have already one point in the intersection—C. To determine a second, we draw two lines parallel respectively to the lode and the vein, at the same absolute level. Suppose the amount of dip of the cross-course to be a degrees, and of the lode b degrees, and if we take h to represent any vertical distance below the position of C at which to draw our levels, then the distance (k d) at which we must draw our parallel to the vein will be found by the formula—

$$k d = \frac{h}{\tan a}; \text{ and the distance, } D f = \frac{h}{\tan b}.$$

For if in Fig. 9 k s represent the dip of the cross-course, making the angle a with the horizontal k d, and d s = h, that is the depth of the level we have chosen, then obviously

$$k d = \frac{h}{\tan a}; \text{ similarly with } D f.$$

If, then, we draw these parallels, the point of intersection, i, will be another point in the line of intersection of the planes of the lode and vein, and we can now draw the line of intersection through C and i. Now comes Schmidt's rule:—Strike a perpendicular through the dislocator, and on whichever side of the line of intersection that perpendicular falls it is on that side you must drive. Thus, in Fig. 9, continuing the cutting of the lode through the dislocator at C, the perpendicular would fall on the left hand side of the line of intersection, and, consequently, according to the rule, the broken part of the lode will be found on that (left hand) side; in other words, drive away from the line of intersection, not through it.

Mr. Henwood in his work has tabulated a large number of observations, and he found in the lodes he examined that 22.7 per cent. were intersected by cross-courses, and not heaved; the proportion heaved to the right hand 51.1 per cent., and to the left hand 26.2; so that the miners are not so far wrong in saying that you have a greater probability of coming to the lode on going to the right hand than to the left; but, from the variations I have referred to, it is evident we cannot always rely on that rule. Those heaved to the side of the greater angle were 63.5 per cent.; to the side of the smaller, 12.9; and the mean distance of throw was 16.4 feet. The rule of Schmidt will be found to hold good in the great majority of cases, but there are certainly some cases in which it does not.

EXPLOSIONS IN MINES.

At the Manchester Literary and Philosophical Society meeting (Mr. E. Schunck, the president, in the chair) Mr. E. W. Binney said that the fearful loss of life in our coal mines deserved the careful attention of all societies like theirs. It ought to be one of the objects of science to endeavour to find out the cause of these explosions, and to devise some means to prevent their occurrence or lessen their frequency. No doubt Government inspection had been of service, and the examination of managers would tend to improve the efficiency of mining officers; but notwithstanding these improvements the explosions of fire-damp are sadly too frequent. The lamentable events which have taken place during the last ten days clearly show that they sometimes occur without any great change in the barometric pressure of the atmosphere, although undoubtedly sudden depressions in a barometer ought to caution miners against emission of gas from the seam of coal and coal waste, and put the men more on their guard at such times. It has been stated in that society that certain conditions of the atmosphere quite irrespective of barometric pressure may have something to do with causing the "drag" in the currents of air circulating through a mine, as explosions have frequently occurred during an east wind and a muggy state of the atmosphere, and a vesicular condition of water in the air has been suggested as the probable cause of this lessening of the speed of the air passing through the galleries of mines. Now, careful observations with a good anemometer in the return air course of a mine ought to determine whether or not such an effect is produced, and thus settle this point by direct experiment. Another source of accidents at this time of the year has to be taken into consideration. Before Christmas and in cold weather there is often a brisk demand for coal, and both managers and men are in a hurry to increase the output, and under such circumstances probably there may be sometimes not so much care and caution exercised as are necessary for them to use in the dangerous work in which they are engaged. In the management of a fiery mine, in my opinion—1. There ought not to be any unventilated wastes—2. The mixed use of Davy lamps and naked lights should not be permitted where the former are commonly employed—3. Blasting of coals by gunpowder should not be sanctioned where Davy lamps are in common use—4. An

stethometer under the care of a competent man should be in constant use in order to see that a sufficient current of air is passing through the workings to ensure perfect ventilation of the mine—5. When there are marked indications of fire-damp in a mine, shown by a cap on the flame of the lamp, the men engaged in hewing and drawing coal should be removed from the pit until by ventilation the place is cleared of gas and rendered safe for a working collier. The above precautions may probably cause an increased cost in the getting of coal, but they are necessary for the preservation of human life if such catastrophes as now frequently occur are to be prevented. It is now pretty generally admitted that all explosions of fire-damp are caused by there being too little pure air and too much of that gas in a mine.

ON THE USE OF GUNPOWDER IN MINES.

A public meeting, convened by the Wigan Miners' Association, was held to hear an address from Mr. W. Pickard, miners agent, on the use of gunpowder in coal mines where it is known gas is given off. Mr. Pickard, in the course of his address, said no greater question could occupy the attention of practical miners throughout the whole of the kingdom than the use of gunpowder in mines, and it behoved them, in regard to that subject, to use all constitutional means in their power to rectify whatever they considered wrong. From 1710 to the present time over 5000 colliers had been killed by explosions more or less connected with the use of gunpowder. Science and philosophy had done a great deal to prevent such terrible catastrophes, but much remained to be done to protect the miner from danger and from death. Scientific men said that 75 per cent. of the accidents that occurred were preventible, and if that was actually true it was the duty of the masters, as well as the men, to combine to see if something could not be done to improve matters. Life was not so valuable in the eyes of many colliers as it ought to be, and there was urgent necessity for increased knowledge on the part of the workmen. Some of the men advocated going on in the old way and exercising caution. That was all very well in its place, but something more was required. In the Wigan district they had 13 or 14 explosions, taking away, since 1868, something like 500 men. At Hindley Green, on Nov. 26, 1868, 62 men's lives were sacrificed; on Dec. 21, 1868, 7 men; on Dec. 30, at Haydock, 26 men; on July 21, 1869, at Haydock, 59 men; on April 1, 1869, at High Brook, Garswood, 31 men; on Nov. 15, at Low Hall, 28 men; at the Moss Pits, in 1870, 72 men; and on July 17, 1875, at Ince, 15 men. All these accidents had more or less occurred through the use of gunpowder, the gas igniting after the firing of the shot. In Wigan they had certain modes of doing work that were liable to accident, and they ought to put their veto upon such things and prevent their recurrence. The practice of firing shots when the mine was full of colliers was an insult to science as well as to humanity. By organisation they had succeeded in obtaining from Government the Mines Regulation Act. Against the provisions of that Act he had nothing to say, but he lamented they were not carried out as they should be. Sometimes colliers were accused of causing accidents through carelessness in taking tobacco and matches into the mine, but from his own knowledge he could assert that not one of the accidents which had occurred in recent years in the Wigan coal field had been traced to that cause. Gunpowder was at the root of the evil, and until something was done to restrict its use the lives of thousands of miners in the country would be in daily danger. He did not advocate the total abolition of gunpowder in mines, for some mines were totally different from others, and different modes of working them were required; but, at all events, he thought it was right that Government should forbid the firing of shots while the colliers were in the mine. A number of persons, including Mr. Macdonald, Mr. Burt, and himself, held a meeting in London in July, and drew a series of resolutions bearing on the question, which they submitted to the Home Secretary, who said he would take no reference to the matter until he had consulted the Mines' Inspectors. That had been done, but Mr. Cross had promised that he would not amend the Act of 1872 until the representatives of the men communicated with him again. Circulars had been drawn up and circulated throughout the district, inviting the opinions of miners on the question, and, when those were received, Mr. Macdonald would know what views to lay before Mr. Cross and the House of Commons. He advised the men to meet at their respective pits and fill up the forms supplied. A resolution was carried to the effect that the present state of affairs should be discontinued, but a motion that gunpowder should be prohibited in all mines where safety lamps were used was negatived, Mr. Pickard advising the meeting to wait until the whole of the men in the district had expressed their views before coming to such a conclusion.

REMARKS ON DEEP BORING AND DEEP MINES

At a recent meeting of the Geological Society of Glasgow, Mr. D. C. GLEN, C.E., submitted a paper on this subject. A series of cores was recently presented to the society by Mr. H. R. Robson, the President of the Institution of Engineers and Shipbuilders in Scotland, and this led to the preparation of the paper, which was illustrated by maps, sections, tools, &c. The author first spoke of the various modes and machines used in what miners call "boring." The object for making a bore-hole into the crust of the earth is to ascertain where and at what depth the various rocks, minerals, and other substances lie; and the bore is sometimes made for the purpose of getting water or petroleum oil. The method of doing this when the ground is soft through which the bore passes is to use what carpenters call a shell auger, with a cross handle fixed on the upper end, and worked by a sufficient number of men. As the hole gets deeper other lengths of rods are screwed on until the required depth is accomplished. Of course during this process the boring rods and auger have to be withdrawn in order to clear out the recess which is filled with the debris; and so a record is also got of the various formations through which the bore has passed. When rock or other hard substances have to be passed through, a steel chisel-pointed jumper is used, alternately lifted and dropped by the men. In this case the debris has to be taken out of the hole by means of a tube provided with a valve at the lower end; and as the jumper is worked in water the debris is in the form of mud, and as some portions of the upper strata fall into the bore-hole, this mud is not always a correct indication of the substance at the bottom of the bore. The upper part of the bore is often lined with tubing, to keep out water and the softer substances, such as sand and mud, which may have been passed through. When the bore gets deep, and the boring rods too heavy to be lifted by four men, a long tree trunk is used as a lever; and sometimes a steam-engine is required to give the desired percussive or jumping action to the boring rods. In order to save the time lost in withdrawing the rods, the Chinese have a system of using rope instead of rigid rods. But this is objectionable, as it sometimes makes the hole untrue, and should the rope break the heavy chisel is left in the hole. Messrs. Mather and Platt, of Manchester, have made some remarkable borings by means of their ingenious cutter, worked by a flat wire-rope.

An improved method of boring is to have, instead of a chisel jumper, a tube with steel cutters forming a kind of saw, which, being made to revolve, cuts out a solid core or cylinder of the rock passed through. The cylinder, when brought to the surface, not only gives a true sample of the material, but also indicates the dip or inclination of the strata. This system has been improved upon by Major Beaumont, R.E., whose plan is to fix on the bottom of the boring rod a steel tube, which is faced on the lower end with a number of rough uncrystallised diamonds, named carbonite. Unlike the others described, this boring tool is made to revolve with its face in constant contact with the rock, similar to a drill or cutters in boring iron or other metals. A jet of water is forced down the centre of the hollow boring rods, which keeps the face of the cutters cool, and at the same time carries the debris up to the surface. This drill can be worked at a speed of 250 revolutions per minute, at a pressure of from 400 lbs. to 800 lbs. per square inch. It will then bore granite and the hardest limestone at the rate of 2 in. to 3 in. per minute, sandstone at 4 in., and quartz at 1 in. per minute. The

diamonds known as carbonite have of late been much used for the cutting or dressing of millstones of French "burr." This is accomplished by having a diamond fixed in a small steel holder, which is worked in a straight slide fixed over the face of the stone. By means of the diamonds, the face of the stone is cut or scratched, so as to make a suitable cutting surface for grinding the flour. Latently carbonite has been applied to the dressing of freestone ashlar by fixing a number of diamonds in a gun-metal or steel block, and giving them a reciprocating and traversing motion over the face of the stone. It is expected that when this machine is completed it will dress from 600 to 1000 square feet per day, or as much as 100 or 150 men can do in the same time.

Mr. GLEN gave following examples of the deep borings and sinkings:—The depth of the Artesian well at Grenelle, near Paris, is 1798 ft., and the bore passes into the gault formation. It yields 476 gallons of water per minute, the water rising to height of 32 ft. above the surface, and the temperature is 81° Fahr. The well in Trafalgar-square, London, is 333 ft. deep. It descends into the upper chalk. A bore-hole for exploring the coal measures at Creusot, in France, by Herk Kind, is 920 metres, or 3020 English feet, in depth. The deepest bore yet made is in Prussia, at Sperenberg, 23 miles south of Berlin. It has reached the great depth of 4172 ft., and cost 8717L, or about 43s. per foot. The deepest coal pit in Scotland is the Victoria Pit, at Nitshill, where the Huslet coal is worked at a depth of 175 fms., or 1050 ft. The Monkwearmouth Pit, near Sunderland, was for many years the deepest in England. It is 300 fathoms, or 1800 ft. in depth. Another pit, lying more towards the dip of the coal field, is a few fathoms deeper. The deepest pit in England is now at Dukinfield, near Manchester, belonging to Mr. Astley. Its depth is 408 fms., or 2448 ft. It passes through 22 workable seams of coal. The deepest pits in the world are now in Belgium, in the coal fields lying between Mons, Charleroi, Namur, and Liège. The shafts in several cases are over 750 metres in depth, or 2460 ft.; and one shaft at Gilly, near Charleroi, is 1040 metres deep, or 3411 ft.; and one part has now reached the depth of 3489 ft.

shareholders are so fully and completely informed of the actual condition of affairs. You have the cash statement made up to the day of the meeting, you have the report from the agent of the mine (which only reached us this morning), you have the statement of accounts, not only of the profit and loss, but also of the liabilities and assets, and you have likewise the cost of the materials used at the mine, so that if any shareholder thinks we are paying too much he has only to call the attention of the committee to it, and the committee are always ready and happy to carry out any suggestion for the benefit of the mine. We certainly have been little disappointed that we are unable to report the completion of Husband's pneumatic stamps and the engine to work them, because we had been led to believe they would have been finished by the end of the year, but I am happy to inform you we have received a telegram from Messrs. Harvey and Co., the engineers constructing the stamps, as follows:—"Your stamps will be delivered on the mine next week, and the engine will shortly follow, and be fixed afterwards." When the stamps are erected it will be a very interesting point in our affairs, because we shall then very soon be able to see as to whether we shall make a profit or not. According to the letter from the agent this morning, there is every reason to believe we shall do well when the stamps get to work—at any rate, we shall then positively know the results. It is also very satisfactory that the call has been so well responded to by the shareholders, because it shows that as a body we have worked together; if the mine is ever brought again into a paying condition it will be by our having the co-operation of the shareholders. Those shareholders who elected at one time, as they had a perfect right to do under the Cost-book System, to relinquish the shares, are entitled to an average of 10s. per share, whereas I see by the *Mining Journal* the quotation of the shares is 3L, which looks like a move in the right direction. I now move that the accounts be passed and allowed.

Mr. WALKER seconded the proposition, which was put and carried unanimously.

Upon the proposition of Mr. ALLEN, seconded by Mr. WALKER, the reports were received and adopted.

The committee of management were re-elected, and the usual remuneration voted.—Mr. W. MOATES was re-elected auditor.

The CHAIRMAN said the next resolution was really a vote of confidence in the committee. The shareholders had had confidence in the committee for a great many years, and he had no doubt that confidence would be continued. He would first read the resolution—"That the committee be authorised and empowered to dispose of the whole or such part, as they in their discretion may think fit, of the shares now standing in the books of the company on the 'relinquished share account,' upon such terms and at such time as they may deem expedient." The shareholders were doubtless aware that about two years since several shareholders thought fit to exercise the undoubted right which they had under the cost-book system to relinquish their shares in the company, and receive from those who remained their proportion of the valuation of the assets. The consequence was the shareholders who remained had to pay in July next a sum of 685L. In order to know their position, a special meeting was held on Aug. 13, 1874, at which the shareholders empowered the committee, if necessary, to make a call of 2s. 6d. per share for that special purpose; of course it was desirable that they, as a committee, should have the power to deal with those shares, as it would relieve them from the necessity of making further calls by converting a dead asset into a living one. Whether they would be able to sell the shares or not was not a question for them now to go into.

A SHAREHOLDER enquired what number of relinquished shares there were?

Mr. TRURAN said there were 1227 relinquished shares. The CHAIRMAN said that as things turned out those relinquished shares strengthened the company's financial position, although its position was damaged when the relinquishments took place. Assuming the value of those shares to be (say) 3L each, that would give the mine 3681L. It was not proposed to throw them upon the market, as that would injure themselves. There seemed reason to believe from the improvement in the shaft that the shares might further rise in value.

A SHAREHOLDER suggested that as about 10s. per share had to be returned to the holders of the relinquished shares a call should be made to meet that liability, and the shares cancelled.

Mr. MARSDEN (a member of the committee) said that they need only place a few of the shares upon the market to cover the liability, and the company were not bound to pay the amount till July.

Mr. ALLEN suggested that the shares should be offered *pro rata* to the present proprietors.

The CHAIRMAN said if the meeting passed the resolution the committee would consider the best mode of dealing with the shares; the committee only wished to carry out the views of the shareholders.

A SHAREHOLDER said that only a small call would be required to liquidate the whole of the indebtedness, and thus render the disposal of these shares unnecessary.

Mr. TRURAN said a call of about 3s. per share would be sufficient, but legal difficulties might arise if such shares were absorbed in the company instead of absolutely sold. If relinquished shares were disposed of it was quite in conformity with the Stannaries Act.

After some further discussion the resolution was put and carried unanimously.

A vote of thanks to the Chairman and committee was then passed.

The CHAIRMAN thanked the shareholders for this renewed mark of confidence, and no effort would be spared on behalf of the committee always to merit it. (Hear.) The proceedings then closed.

WHEAL GRENVILLE MINING COMPANY.

The general meeting of shareholders was held at the company's offices, St. Andrew's House, Cornhill, on Thursday,

Mr. R. W. GOOLD in the chair.

Mr. T. B. LAWS (the secretary) read the notice convening the meeting and the minutes of the preceding one.

Mr. N. WATSON enquired whether a special meeting had been held to confirm the resolutions for changing the offices, &c., and upon being informed that confirmation had been declared by counsel to be unnecessary, he protested that the present meeting was illegal, and wished his protest to be entered in the cost-book.

Mr. SCHOFIELD moved that Mr. Watson's protest be not accepted; but the Chairman explained that the protest was irrelevant, the meeting had only to determine whether the minutes were correctly entered in the cost-book. The question of the confirmation was put to the meeting and almost unanimously confirmed, Mr. Watson alone dissenting, and all present voting.

The subjoined report of the committee was then read:—

Dec. 30.—During the past quarter we have continued the sinking of West Metal engine-shaft by 12 men, but have not made quite as good progress as I anticipated, owing to, as you have already been informed, a large spar course crossing the shaft bringing in with it hard and wet ground, which also disordered the lode for some time; but by sinking about 9 or 12 ft. through this hard rock, we came down on well defined Killas ground and a soft lode, since which the lode has gradually improved, both in appearance and value, and this morning I have broken rich stones of tin from a well-defined lode in the bottom of the shaft 2 fms. wide; there are also several branches or droppers falling down on the lode which, I think, cannot fail to produce good results. We have sunk nearly 9 fms. below the 70, and if the lode continues improving I purpose to sink on another month and make it a 11 or 12 ft. level, where I hope we shall have a paying lode to drive on both east and west of shaft. The 70, west of shaft, is driving by two men; here the lode is not so good, occasionally a little tin, but not sufficient to pay for working; and when we commence to drive the 80 I shall recommend the suspension of this level until the 80 should be driven up to above this ground. The rise in the back of the 70, east of shaft, is not yet driven up to above the 60. The winze sunk in the bottom of the 60 by the former workers not having been sunk as was reported to us by over a fathom, in clearing up the winze we found the lode contained a little tin, and we have also had some tin in the rise in the last 6 ft. driving, we expect to have this piece of ground some time next month, after which we purpose sinking a winze in the bottom of the 70 about 10 fms. east of shaft to open up the ground from the 70 to the 80 by the time the 80 is extended so far. We have been driving the 40, west of shaft, on the branches at 3 ft. 15s. per fathom, and the level is now extended from about 10 fathoms. This drivage has produced tin to the value of from 4 to 5L per fathom, which is the character of the present end. The present low price of tin is seriously against this low-class tinfield, but with anything like a fair price for tin this ground would pay very well. During the past two months we have had very unfavourable weather for our surface work; we have not been able to do as much in preparing the site for the erection of the engine and stamms as we had hoped to have done, still we have taken the boiler from Wheal Metal to the Wheal Vor dressing floors, fixed in a week from this time, when we shall at once commence fixing the stamms, so by the end of January we shall be at work, when I calculate our returns of tin will be about double, which will greatly reduce our monthly loss, and by the end of another three months I hope we shall be in a position to nearly meet the cost altogether, and I may say that the appearance of both ground and lode in the bottom of the shaft strengthens my opinion in the success of the mine when further developed.—S. HARRIS.

P.S.—I hope to have about the usual quantity of tin for sale to-morrow.—S. H.

Dec. 29.—I went underground this morning, and did not get up in time to write my report and get to Hayle in time for post, as you suggested, but you and the committee may be sure that the stamps will be here and we commence fixing it by the end of next week. A part of the stamps I will think here to-day. I send you by this post some tin that I broke from the very bottom of the shaft this morning. My object in sending it to you is that you and the committee shall see the nature of the stuff, you will observe it is not cleaned very well. I left it so that you might see the prian, &c. I can assure all that I never came from underground better pleased than I did this morning, and as I said in my report should the lode continue to improve I think we better sink (say) 11 or 12 fms., before we drive; of course this will be subject to the committee's approval, but I should like to have something of value to open on. As you know, the weather has been much against surface work, or we might have had the stamps and engine fixed, which I am sorry is not done, but it is no fault of ours, and I hope the committee and shareholders will not think that we have neglected our duty in this matter. We will do our best to have it at work by this day month.—S. HARRIS.

The CHAIRMAN: From the accounts sent you, accompanying the notice convening the meeting, as well as the reports just read, you are placed in possession of all the information the committee are in a position to give. In fact, I will take this opportunity of stating that I do not know any company, either great or small, in which

In advertising to your financial position, your committee see no cause for discouragement, though your liabilities are apparently very heavy. These should, however, be dealt with immediately, and some steps taken materially to lessen them, and to provide for the next three months' working expenses. You committee would suggest that a call be now made of 15s. per share upon the existing capital of the company, and that due authority be given them to issue to the present shareholders the unalotted or forfeited shares now in possession of the company, at such price as may be determined on. They do not say that these operations, assuming the shares to be all placed, will be quite sufficient to place the company in the stable position so much to be desired, but they will, without doubt, enable your committee to clear away the bulk of your liabilities, and justify them in pushing on with the utmost vigour those operations at the mine which are essentially necessary to bring it into a paying state.

Your committee, in conclusion, have to say that if honoured with a continuance of your confidence, they will, as they have done, devote their utmost care and attention to your interests, and if supported by you in carrying out the reforms in the management they think so essential, they see no reason to doubt that they will be able ere long to bring your mine into a very different and far more satisfactory position than it has hitherto occupied.

The CHAIRMAN would not detain them with any observations of his own. They would see that somehow or other they had drifted into a very unsatisfactory state, but all they could now do was to endeavour to bring about an improved state of affairs. He thought it would be better to leave the report in the hands of the shareholders.

The statement of receipts and expenditure from Oct. 6 to the present time showed a balance of 379, 11s. 9d.; the total receipts being 3418, 17s. 1d., and the total expenditure 3039, 6s. 2d.

The CHAIRMAN, referring to a remark of Mr. N. WATSON, said that he was a new shareholder, and unknown to all of them, but he saw enough at the last meeting to understand that there was much personal feeling introduced which, as chairman, he certainly should not permit on the present occasion. He would, moreover, say that if the Watson party, and he did not use the term disrespectfully, would not start any personalities they would find that they were met by no desire to throw any reflections upon the former management.

The assets and liabilities showed that £4000 was owing for merchants' bills, and that the estimated balance of liabilities over assets to the date of the next meeting was 5189, 1s. 8d.; this included provision for the next two pays and the two corresponding sales of tin.

Mr. SCHOFIELD understood that at the present moment they were about 4500L in debt, and thought it disgraceful that a company such as Wheal Grenville, with a good proprietary ready to pay up as required, should be in such a position.

Mr. N. WATSON asked whether their position was unknown to the shareholders at the date of the last meeting?

The CHAIRMAN thought the discussion of the matter undesirable at the moment, but would say that, so far as he believed, the shareholders' position was not accurately stated at the last meeting. The report of the committee had been read to the meeting, as well as the accounts, and he would move that the report and accounts be received and adopted.—Mr. SCHOFIELD seconded the motion, which, Mr. N. Watson excepted, was carried unanimously.

The CHAIRMAN said that as Capt. Hosking was present he would like to ask him a question as to the yield of the ore. The two sales of ore since the last meeting had both shown a falling off. He wished to know how Capt. Hosking accounted for the falling off, and thought he should explain how, with more ground opened, there had been a falling off.—Capt. HOSKING explained that it was the flat lode which they were chiefly working upon at present, and although the lode was truly stated to be worth 10s. or 12s. per ton, the lode was so large, and the tin, consequently, so much disseminated, that they could not take it away at a profit. The lode was worth about 1½ per cent. for tin.

Mr. SCHOFIELD asked how much tin they got from each ton of ore?—Captain Hosking said they would get from 2½ to 3 cwt. from every 10 tons of stuff, so that it would be, as Mr. Schofield estimated, worth about 12s. or 13s. per ton; they paid the tributes 6s. 6d., and it cost 4s. or 5s. per ton to dress, so that there would be 1s. or 1s. 6d. per ton of ore profit.

The CHAIRMAN then proposed that a call of 15s. per share be made.

Mr. BETHERINGTON, in seconding the motion, enquired how far it would reduce their liabilities?—The CHAIRMAN said it would go far toward clearing their present liabilities, but would not provide for current loss. He would, of course, prefer a call of 17s., but it would be more than they actually required at the moment, their liabilities being but 4500L. If poor shareholders could not pay it was so much the worse for them, and their shares would have to be dealt with by a future meeting; but, at the same time, he did not wish the opinion to be created that they wished to drive anyone out.

Mr. SCHOFIELD said that, as new shareholders, were really paying the old shareholders' debts, for the concern had never been out of debt since it started.

Several shareholders suggested that the call made should be sufficient to pay off all liabilities; and Mr. GUTIERREZ proposed as an amendment a call of 17s. 6d. per share, but at the suggestion of the CHAIRMAN the amendment was withdrawn, and the 15s. unanimously agreed to. Mr. N. Watson not voting.

The CHAIRMAN considered it would be best for the meeting to take action, if they thought fit, upon the report of the committee, but if the shareholders preferred to leave the matter in the committee's hands they would not shrink from doing what was necessary; it would, however, relieve the committee of much responsibility if the meeting passed a resolution to the effect that the management of the mine be removed from Capt. Hosking's hands and placed in those of someone else. He would himself have proposed that Capt. Secombe should have been appointed, but in this his co-commiteemen did not agree with him.

Mr. LANE said that the difficulty was that Capt. Secombe would not take the management to devote his whole time to it.

Capt. SECOMBE said that in his report to Mr. Goold he had recommended a man who would, he was sure, give them satisfaction. He believed Capt. Hodge was a Redruth or Camborne man, with good experience in the mining; he had him under him for five years, after that he went out to Portugal, and then returned to Wales, where he had been engaged in lead mining. If the mine were his own Capt. Hodge was the man he would appoint. If he took the agency he would give up equally profitable employment in Wales. He would only appoint him upon condition that he gave his whole time to the company, but he would allow him to inspect any mine in the neighbourhood if he had an offer of engagement to do so.

It was ultimately resolved that the services of all the present agents, including the purser, be dispensed with as and from the date of the next pay-day, and that the committee take the necessary steps to carry this resolution into effect.

The motion was unanimously carried, as was also the appointment of Capt. T. Hodge at a salary to be arranged by the committee, and the committee were authorised to fill up such other of the vacancies as they might deem necessary. Mr. N. Watson alone dissented. It was distinctly to be understood that Capt. Hodge should devote his whole time to the service of the company.

It was resolved that a special meeting be called for Jan. 20 to forfeit shares in arrear of calls made previous to the present meeting.

The SOLICITOR, in reply to an enquiry, stated that he did not anticipate any difficulty in obtaining the assignment of the lease from Mr. J. Watson, the late secretary. He had received an abstract from Mr. Boyle, and would attend to inspect, after which the assignment would be drawn up. There had been some delay, but he did not think further delay was to be feared. They had experienced no difficulty from Mr. J. Watson.

The CHAIRMAN explained that no responsibility could possibly attach to the late secretary after the assignment of the lease, which he only held as trustee for the company. With regard to Mr. N. Watson's suggestion that the original lessees might withdraw from the lease, that course was, no doubt, possible, but they had no thought of Mr. J. Watson taking that course, though he did, the Court of Chancery would set the matter right in five minutes, and almost without cost.

Mr. DOWLING suggested that in future the report and accounts should be circulated a few days before the meeting.

The CHAIRMAN had no doubt that under the new management they would be able to meet the wishes of the shareholders.

Mr. LANE said they should be sent with the notice convening the meeting.

A vote of thanks to the Chairman terminated the proceedings.

SCOTTISH AUSTRALIAN MINING COMPANY.

A special general meeting of shareholders was held at the London Tavern, on Wednesday,

Mr. ALEXANDER W. YOUNG, M.P., in the chair.

The notice convening the meeting having been read by Mr. C. GRAINGER (the secretary), the CHAIRMAN explained that the object of the meeting was simply to confirm the resolutions which were passed unanimously at the special meeting held on Nov. 29 last, effecting certain alterations in the Articles of Association of the company.

The SECRETARY having read the resolutions, the CHAIRMAN proposed "That the said resolutions be and hereby are confirmed," and the motion having been seconded by Mr. F. P. WARD, it was put to the meeting by the Chairman, and passed unanimously.

The CHAIRMAN: That, gentlemen, concludes the business of the meeting, and I am obliged to you for your attendance here to-day for the purpose of completing it. But, as we are assembled I think I should avail myself of the opportunity of stating that since we met here on this day month intelligence has been received by the board from the colony, which we regard as specially important to us as colliery owners there. The coal trade of New South Wales has long been gradually and steadily increasing year after year, and the Government have found it necessary to provide additional facilities and appliances for shipping coal at the wharf at the port of Newcastle; but what I more particularly refer to is the circumstance that the Government are constructing a new wharf for the purpose at Bullock Island, which lies in that part of the Hunter which constitutes the harbour of Newcastle, and that the Great Northern Railway, by which the coal of the various collieries is conveyed to the existing wharf, is to be connected by means of a bridge and a short branch line with the new wharf also. (Hear, hear.) The company, for a considerable time past, have been the owners of a portion of Bullock Island, and while thus connecting it with the main line will give new facilities for the shipment of coal, it may fairly be expected to add to the value of the land that the company own there. The company's trade for the first four months of the current half-year had been satisfactory—about equal, in fact, to that of the previous six—and if it should continue as good throughout the last two months, which there seemed reason to expect would be the case, he thought they would be justified in anticipating a decidedly favourable result from their current six months' colliery operations. (Hear, hear.)—The proceedings then terminated.

NORTH BUSY.—At the general meeting of shareholders, on Tuesday, the purser (Mr. Thorman Woodward) congratulated the shareholders on the improved position and splendid prospects of the mine, which enabled them on that day to pay their first dividend. The labour costs and bills were charged up to the end of October, and merchant supplies paid for up to that date, a position which very few mines in the country can boast of. The accounts were passed and deemed very satisfactory, showing a handsome profit on such a young concern. A dividend of 10s. (ten shillings) per share was declared payable forthwith, and after payment thereof there remained a balance of 218, 9s. 7d. to carry to the credit of the next

four-months account. The agents report was encouraging, and the mine was considered likely to become a very profitable one.

[For remainder of Meetings see to-day's Journal.]

RIO TINTO COMPANY (LIMITED).

The directors announce that a deputation from the board, consisting of the Chairman, Mr. Denny, and Mr. Doetsch, accompanied by the consulting engineer, Mr. David Forbes, has recently returned from visit of inspection to the mines. These gentlemen have furnished an exhaustive report, of which the following is the substance, and the directors consider it will be of interest to the proprietors:—

EXTENT AND POSITION OF DEPOSITS.—The members of the deputation were profoundly impressed, in common with all who have visited Rio Tinto, with the enormous extent of the mineral deposits, and with their singularly advantageous position for being economically worked on as large a scale as may be desired. An inspection both of the underground workings and of the large surface of ore in the open already uncovered by the removal of the overburden, amply confirmed all that has been said of the vast resources of the mine in that portion of it which the company is now working, while at the same time there lies beyond a still more extensive deposit on the north lode, which will afford supplies of mineral in future times that may be said to be practically inexhaustible.

OVERBURDEN.—The deputation found that under Mr. Baum's management great progress had been made in the removal of the overburden, no less than 50,000 tons having been tipped in most convenient positions, and at a small cost,

the portion which is composed of iron ore having been separately tipped in a pile by itself, in case at any future time circumstances should make it desirable to either manufacture iron upon the spot, or to ship the iron ore to England. The portion of the lode now uncovered is estimated to contain over 300,000 tons of ore, above the line of the high-level tramway, while below that line, down to the next level, that of the Santa Barbara adit, the estimated quantity is 500,000 tons more.

INCLINE.—The pyrites from the open cast intended for shipment is at once loaded into the railway wagons, and sent down to the railway station by the self-acting incline which is worked by the brake machinery supplied by Messrs. Head, Wrigg, and Co. The incline is now in perfect working order, and about 500 tons per day are sent down by it to be forwarded to Huelva. The remainder of the ore taken from the open cast is loaded in tipping wagons drawn by locomotives and forwarded by the high-level tramway to the coaling floor.

SAN LUIS ADIT.—The principal access at present to the interior of the mine is the San Luis adit. The deputation traversed large portions of the 9th, 8th, and 7th floors. Mr. Baum has here 360 miners at work in two shifts, with an out-turn of about 280 tons per day. The ore is brought out in wagons drawn by mules on a 2 ft. gauge tramway, and when transferred into the railway wagons is passed over a screen which removes the suds and dust. These are forwarded to the calcining floor.

TIRITO TUNNEL.—It was with special interest the great tunnel was inspected. It is 1800 ft. long, and tapers the mineral at a depth of 280 ft. from its surface. At the end of the 1st the contractors were encountering difficulties when within a few inches of the main lode. These have since been overcome, and the heading of the tunnel has now reached the ore. The break-down and the masonry lining are well forward, and communications with the upper parts of the mine are immediately to be commenced. These will occupy some time, but when they are completed an unlimited supply of ore will be obtained.

SANTA BARBARA TRAMWAY.—Meanwhile another outlet for mineral has been authorised—a tramway to connect the Santa Barbara adit with the railway station, to be completed by the end of April next.

CIMENTATION.—The manufacture of copper precipitate from the cupreous waters by means of iron was in full operation. The tanks are well arranged, every drop of water draining from the mine is saved and made to do duty here, and in consequence of the serious drought which has prevailed for nearly three years, recourse has been had to pumping the used water over the enormous heaps (terceros) of cuprous refuse, and passing it again through the tanks.

WATER.—The serious question of water could not but occupy the attention of the deputation; and in view of the repeated dry seasons, and the comparatively insignificant supplies of water to be obtained by pumping, the suggested site of a proposed reserve dam was examined, and the conclusion arrived at that the work must be at once undertaken. Plans had already been prepared by Mr. Stileman, the hydraulic engineer, of Westminster, and all that remains to be done before commencing the work is to obtain the approval of the Government mining engineer.

RAILWAY.—The deputation made a careful inspection of the whole line, personally examining the bridges, culverts, and retaining-walls. In the upper portion of the line it passes through a most difficult country, following the course of the Rio Tinto, a tortuous rocky stream. The curves and gradients are well arranged, and the latter are favourable to the load on the downward journey. The trains pass over the line very smoothly, and the opinion formed of the work was most favourable. The station ground at Huelva is ample, and admirably situated, and the workshops and other buildings of suitable construction. The same may be said of those at Rio Tinto, where the engine stables and shops are about three kilometres down the line, to keep the plant out of the way of injury from the fumes of sulphur. The rolling stock is of a very superior description, and is answering its purpose well.

ORE DEPOT.—At a distance of about three kilometres from the station at Huelva a convenient depot for 100,000 tons of ore has been constructed.

SHIPPING THE ORE.—The temporary arrangements for shipping the ore by means of barges, pending the completion of the pier, have been well contrived, and are working admirably. The shipments are steadily increasing, and now amount to between 3000 and 4000 tons per week, from 400 to 1000 tons per day being easily shipped, according to the state of the tide.

THE FIRE.—This is truly a noble structure, and is rapidly nearing completion.

The last of the iron piles have been screwed in, and the shutes for discharging the ore from the wagons into the holds of vessels alongside have now arrived, and will shortly be in position. The deputation carefully considered on the spot the best means of protection against fire, and their recommendations have already been adopted by the board.

SCHOOL AT RIO TINTO.—The population at the mines being to a very large extent dependent upon the company, the question of education for the children and young people could not but force itself on the attention, and the board has under consideration how best to carry on a work which was inaugurated at an early period by one of their number at his own expense. They are confident the proprietors will support them.

GOLD AND SILVER MINING REVIEW.

A very buoyant feeling exists in California, judging by the tone of the public journals, in regard to the mining prospects of the Pacific States. The heavy shipments of bullion during the present year have removed, it is said, the prejudice against the mines, and given them a better appreciation. Investments in mining projects and developments are now regarded as legitimate and laudable enterprises.

A cheerful and encouraging view of the importance and of the prospects of mining industry has taken the place of stereotyped croakings and warnings against hazardous undertakings. It is feared, however, that "owlish predictions about inevitable crashes, unwarranted inflations," &c., will soon be resumed, otherwise the conclusion would be arrived at that wonders never cease. It is claimed that the mining interest never numbered among its adherents so many first class citizens and experienced business men as at the present time. However this may be, it is manifest that great energy and activity are being displayed in making new mineral developments, and the excitement and enthusiasm of the stock market indicates a recovery from the panic caused by the failure of the Bank of California.

The new improvements at the Consolidated Virginia Mine are rapidly approaching completion, and will soon be turning out its rich ores as usual. In the mean time a considerable quantity of ore is hoisted through the Gould and Curry shaft. For the week ending Nov. 27 there were 682 tons of ore extracted; 718 tons and 350 lbs. delivered to mills; 120 tons and 1900 lbs. remaining in ore house; and \$71,533 in bullion shipped; on Nov. 29, 14 bars of bullion shipped, value \$46,606 14; total since dividend, \$313,118 39. The bullion shipments for the first 12 days in October, prior to the fire, amounted to \$1,000,999, being the largest amount ever produced in that time in this country. The Gould and Curry shaft was down 865 ft. on Nov. 24, and was progressing at the rate of 4 ft. per day. The work of rebuilding the destroyed hoisting works and mills at the Ophir Mine is progressing rapidly. The principal buildings are finished, and the machinery is erected. A large force of miners is employed on the 1450 and 1650 ft. levels preparatory to resuming hoisting operations, the water being kept down by a donkey engine. The Winfield mill is kept running on reserve ores from the Ophir. On Nov. 27 the company shipped two bars of bullion, valued at \$7,589 97; on Nov. 29 two bars, valued at \$6511 36; and on 1st inst. three bars, valued at \$10,967 98. There is no change in the general appearance of the mine. The ore breasts are looking about as usual. The yield of the mine for three months ending Sept. 30 was 14,893 tons, which assayed \$42,60 per ton.

The Imperial Mine has a daily yield of 50 tons of ore, the average assay of which ranges from \$50 to \$75 per ton. The ore breasts on the 1900 ft. levels are gradually widening out, and promise a better yield than was expected. Three bars of bullion were shipped on the 27th ult., valued at \$7082 64. The Crown Point Mine is supplying sufficient ore to run the Canyon mill, the Devil's Gate mill, and the Mexican mill to their full capacity, crushing in the aggregate 425 tons per day. The mine has a daily yield of about 300 tons of ore. The Cholula Potosi Mine has a daily yield of 60 tons of ore, the assay value of which is \$27 per ton. The Leopard Mining Company crushed 335 tons of ore in 15½ days, since Nov. 13; value per ton, \$140; gross value of silver, \$46,902 57; bullion shipped, \$40,182 71; working percentage of gross value, 85%. The Raymond and Ely Company shipped on the 20th ult. \$10,914 15 in bullion. The Indian Queen shipped on Nov. 24, five bars of bullion, valued at \$4769 28. The Northern Belle shipped on the 23rd ult., four bars of bullion, valued at \$7937 50. The "Arizona Citizen," of Nov. 20, says:—"During the week 6500 lbs. of very rich silver ore was received here by Governor Safford and associates from their mine in the Pinal mountains. The ore is sacked, awaiting transportation to Yuma, and thence to San Francisco. Careful assays show the lot to be worth an average of over \$900 per ton, and one chunk of 300 lbs. is believed to be worth \$300. Many pieces of ore show metallic silver. Arrangements are made for the continuous shipment of ore."—*Railway World* (Philadelphia, Dec. 18).

THE TRADE IN QUICKSILVER.—The quicksilver traffic is large, and may be said to be quite remunerative. The foreign exports of San Francisco in October last were valued at \$178,514, and this is about the average for each month of the year. The exports are to China, Japan, Chili, Mexico, Bolivia, New Zealand, British Columbia, South America, Central America, Hindostan, Russian Asia, and Australia. China, which uses it largely in the manufacture of vermillion that is sent back in considerable quantity to this country, is the largest buyer, and Mexico next. The receipts of the mineral at San Francisco during the 10 months ending Nov. 1, were 30,788 flasks, against 19,500 during the same period last year.

—an important increase. The flask of quicksilver weighs about 75 lbs. As regards the production of this useful mineral, it is stated that Spain produced last year 36,000 flasks; Austria, 800; Italy, 2700; and Borneo, 2000. California, which annually produces about 45,000 flasks, promises to give nearer 50,000 flasks this year. This State is in advance of any other country in the world in production. San Francisco has more trade in it than even London, though it is not so much ahead of that market as some others. It appears from the official returns of the London Board of Trade, that the receipts there during the nine months ending Oct. 1 were:—1875, 33,393 flasks, value 2,751,688; 1874, 31,413 flasks, value 3,138,208; 1873, 30,133 flasks, value 1,848,526. The exports were 24,990 flasks during the same period this year, 23,787 flasks same period 1874, and 21,632 flasks same time in 1873. The price of quicksilver here in New York is governed almost entirely by the course of the San Francisco market, though London quotations have more or less influence. There is usually a very satisfactory margin between New York and San Francisco, and a large quantity is sent here every year. At present the quotation in the latter market is 65c. gold, while here it is 75c. gold.—*Daily Bulletin*.

ALMADA AND TIRITO CONSOLIDATED SILVER MINING COMPANY (LIMITED).

MINA GRAN

MINING MACHINERY AND TOOLS.

THE TUCKINGMILL FOUNDRY COMPANY,

85, GRACECHURCH STREET, LONDON, E.C. WORKS: TUCKINGMILL.

MANUFACTURERS of every description of MINING MACHINERY, TOOLS, MILLWORK, PUMPING, WINDING, & STAMPING ENGINES.

SOLE MAKERS OF

BORLASE'S PATENT ORE-DRESSING MACHINES AND PULVERISERS.

PRICE LISTS CAN BE HAD ON APPLICATION, AND

SPECIAL QUOTATIONS WILL BE GIVEN UPON INDENTS AND SPECIFICATIONS.

TUCKINGMILL FOUNDRY AND ROSEWORTHY HAMMER MILLS.

TUCKINGMILL, CORNWALL, AND 85, GRACECHURCH STREET, LONDON, E.C.

Teams Patent Hemp and Wire Rope Works,
GATESHEAD-ON-TYNE.

DIXON, CORBITT, AND SPENCER.

MANUFACTURERS of every description of ROUND and FLAT ROPES of any length for COLLIERY, RAILWAY, AGRICULTURAL, SHIPPING, and other purposes, and guaranteed of the highest standard of strength.

Best Selected Charcoal Iron, Best Crucible Cast Steel, and extra strong Improved Steel Round and Flat Wire Ropes; Compound-laid non-rotating Flexible Ropes, for Iron or Steel for small gear and sinking purposes; Best Selected Charcoal Iron Guide Ropes; Galvanised and Plain Ropes for capstans, crabs, suspension bridges, canal towing, &c.; Patent Steel Plough Ropes; Galvanised Signal and Fencing Strands; Copper Rope Lighting Conductors; Steel, Iron, and Copper Bush Cords; Picture Cords; Russian, Italian, and Manila Hemp Round and Flat Ropes; White and Tarned Hemp and Flax Spun Yarns; Round and Flat Rope Pulleys and Patent Springs for same; Galvanised Wire Ropes for Ships Standing Rigging; Russian, Italian, Manila, and Cork Cordage; Towlines, Warps, Service and other Lines for Shipping Purposes; Ships' Rigging fitted by experienced workmen.

D., C., and S. beg to call special attention to the advantages to be derived by adopting their EXTRA STRONG IMPROVED STEEL ROPES, for lifting heavy loads in deep mines, also in hauling from long distances; a considerable reduction is effected in weight, friction materially reduced, and an extra amount of work got out of the rope—a rope 8 lbs. per fathom being equal in strength to an iron rope 12 lbs. per fathom.

Coal-Getting by Patent Hand-Worked Machinery,
WITHOUT THE USE OF GUNPOWDER.

No. 1 MACHINE - THE HAND COAL-CUTTER, for under-cutting.
2 " - THE ROCK & COAL PERFORATOR, for drilling.
3 " - THE SCREW WEDGE, for breaking down.

The use of these Machines, while doing away with the greatest source of danger, economises at least Fifty per cent. of the labour required in Getting Coal.

Particulars on application to—

MARTIN MACDERMOTT,
SCOTT'S CHAMBERS, PUDDING LANE, LONDON, E.C.

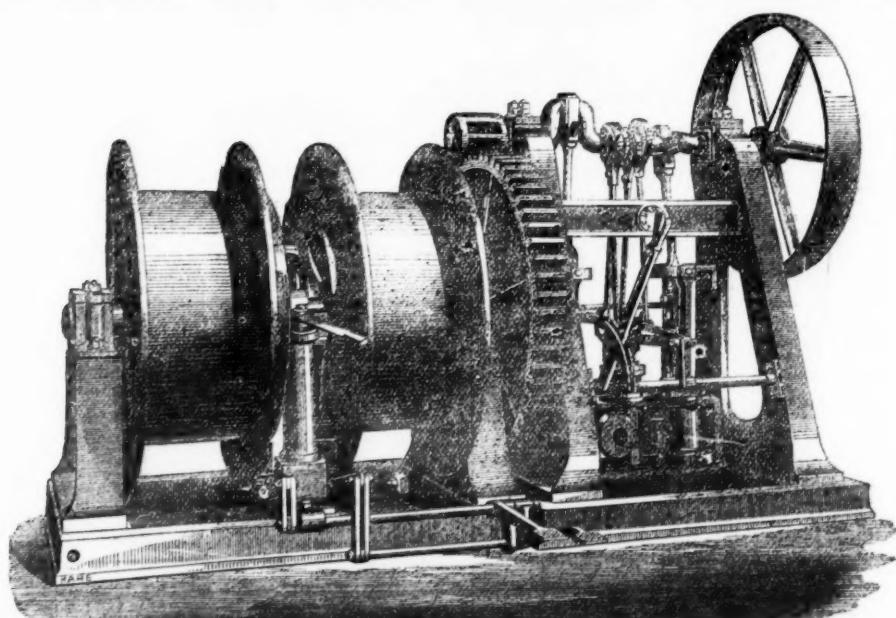
ARTESIAN BORINGS,

For WATER SUPPLY to TOWNS, LAND IRRIGATION, and MINERAL EXPLORATIONS, may be executed of any diameter, from 6 in. to 36 in., and to any depth to 2000 ft.

Pistons & Air-pump Buckets fitted with Patent Elastic Metallic Packing
of which upwards of 8684 have been made to March, 1875.

MATHER AND PLATT,
MAKERS OF LARGE PUMPS AND PUMPING ENGINES.
Improved Valves and Taps for Water, Steam, Gas, &c.
PATENT STEAM EARTH-BORING MACHINE
ENGINEERS and MACHINE MAKERS to CALICO PRINTERS, BLEACHERS, DYERS, and FINISHERS.
SALFORD IRONWORKS, MANCHESTER.
PRICES AND PARTICULARS ON APPLICATION.

I. G. BASS, 18, BOW STREET, SHEFFIELD.



IMPROVED DESIGN of Engine for HAULING, for use with either Steam or Compressed Air.

Takes less room, and can be supplied for less money, than any other Engine of same power.

May also be had with single drum for winding.

PARSONS' WHITE BRASS

Is the BEST and CHEAPEST METAL for the BEARINGS OF RAILWAY CARRIAGE

AND ALL KINDS OF

ENGINES, ROLLING MILLS, AND MACHINES.

It wears fully THREE TIMES as long as GUN METAL, works with less friction, requires LESS LUBRICATION, and is

25 PER CENT. LESS IN PRICE.

SOLE MANUFACTURERS,

THE WHITE BRASS COMPANY,
LOMBARD STREET, SOUTHWARK, E.C.

TO COLLIERY FURNISHERS, &c. &c.

AGENTS WANTED in all Mining Districts for the LANDAU MINERS' LIFE PROTECTING LAMP. For particulars, apply to Messrs. LANDAU, Coal Merchants, and Manufacturers of several important Inventions, 220, HIGH HOLBORN, LONDON, W.C.



STRONGLY RECOMMENDED! HIGHLY APPRECIATED!

THE LANDAU

MINERS' LIFE-PROTECTING LAMP.

The objects attained by the Patent Lamp are:—

- 1.—It is a perfect safeguard against explosion.
- 2.—Great brilliancy of light at a very small expenditure of oil.
- 3.—It is in no way affected by the strongest current of air in the mine.
- 4.—It is impossible for the miner to tamper with it with impunity.
- 5.—All the above improvements can be adapted by Messrs. Landau to any other lamps at present in use.

Important testimonials, confirming the above statements, will be forwarded on application by—

MESSRS. LANDAU,
COAL MERCHANTS AND MANUFACTURERS OF SEVERAL IMPORTANT INVENTIONS,
220, HIGH HOLBORN, LONDON, W.C.

THE

STANDARD LUBRICATING OILS COMPANY
(LIMITED).

95, CANNON STREET, E.C.

The SPECIALITY of the COMPANY'S OILS consists in their CHEAPNESS and FREEDOM from GLUTINATION.

AGENTS WANTED.

TO RAILWAY CONTRACTORS, MINERS, AND QUARRYMEN.

COTTON POWDER.

THE SAFEST, STRONGEST, AND CHEAPEST BLASTING POWDER KNOWN to the PUBLIC or to SCIENCE.

NO SMOKE NOR NOXIOUS FUMES.

WILL NOT EXPLODE WITHOUT A DETONATOR is APPLIED.

Is conveyed by all Railways and the principal Canals at gunpowder rates.

SUPPLIED IN BULK OR IN CARTRIDGES OF ALL SIZES.

Printed details may be had on application to the Company's Offices—

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FAVERSHAM, KENT.

RAILWAY CARRIAGE COMPANY (LIMITED).—ESTABLISHED 1847.

MANUFACTURERS OF RAILWAY CARRIAGES and WAGONS, and EVERY DESCRIPTION OF IRONWORK.

Passenger carriages and wagons built, either for cash or for payment, over a period of years.

RAILWAY WAGONS FOR HIRE.

CHIEF OFFICES, OLD BURY WORKS, NEAR BIRMINGHAM.

LONDON OFFICES, 7, GREAT WINCHESTER STREET BUILDINGS.

THE BIRMINGHAM WAGON COMPANY (LIMITED) MANUFACTURE RAILWAY WAGONS OF EVERY DESCRIPTION, for HIRE and SALE, by immediate or deferred payments. They have also wagons for hire capable of carrying 6, 8, and 10 tons, parts of which are constructed especially for shipping purposes. Wagons in working order maintained by contract.

EDMUND FOWLER, Sec.

WAGON WORKS, SMETHWICK, BIRMINGHAM.

** Loans received on Debenture; particulars on application.

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11, QUEEN VICTORIA STREET, E.C.

First issue of capital: £500,000, in subscriptions of £10 and upwards.

Interest in lieu of dividend 10 per cent. per annum, paid monthly.

Current accounts opened, and 5 per cent. interest allowed on the minimum monthly balances.

CHEQUE BOOKS SUPPLIED.

The Bank transacts every description of sound financial business. Book-keeping in the hands of the subscribers, and a quarterly balance sheet issued by auditors appointed by them, independent of the management.

For particulars apply to—

R. B. OAKLEY, Manager

Now ready, price 3s., by post 3s. 3d., Sixth Edition; Twentieth Thousand Copies much improved, and enlarged to nearly 300 pages.

HOPTON'S CONVERSATIONS ON MINES, between Father and Son. The additions to the work are near 80 pages of useful information, principally questions and answers, with a view to assist applicants intending to pass an examination as mine managers, together with tables, rules of measurement, and other information on the moving and propelling power of ventilation, subject which has caused so much controversy.

The following few testimonials, out of hundreds in Mr. Hopton's possession speak to the value of the work:—

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Second Edition, Just published, price 8s. 6d.

A NEW GUIDE TO THE IRON TRADE OR, MILL-MANAGERS' AND STOCK-TAKERS' ASSISTANT: Comprising a Series of New and Comprehensive Tables, practically arranged to show at one view the Weight of Iron required to produce Boiler plates, Sheet-iron, and Flat, Square, and Round Bars, as well as Hoop or Strip Iron of any dimensions. To which is added a variety of Tables for the convenience of Merchants including a Russian Table. By JAMES ROSE,

OPINIONS OF THE PRESS.

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ONE MILLION STERLING Has been paid as COMPENSATION FOR DEATH AND INJURIES Caused by ACCIDENTS OF ALL KINDS, By the RAILWAY PASSENGERS' ASSURANCE COMPANY.

Hon. A. KINNAIRD, M.P., Chairman.

PAID-UP CAPITAL AND RESERVE FUND £180,000.

ANNUAL INCOME, £200,000.

Bonus allowed to Insurers of Five Years' standing.

Apply to the Clerks at the Railway Stations, the Local Agents, or—

64, CORNHILL, and 10, REGENT STREET, LONDON.

WILLIAM J. VIAN, Secretary.

BLAKE'S PATENT STEAM PUMP.

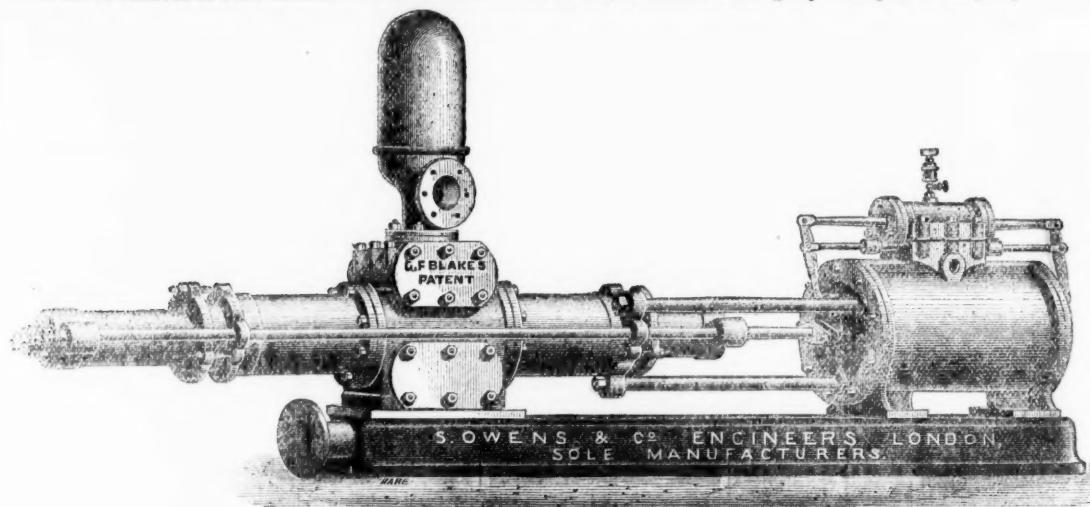
MORE THAN 8000 IN USE.

SOLE MAKERS FOR GREAT BRITAIN.

S. OWENS & CO.,

Hydraulic and General Engineers, Whitefriars-street, London;
And at 195, Buchanan-street, Glasgow (W. HUME, AGENT).

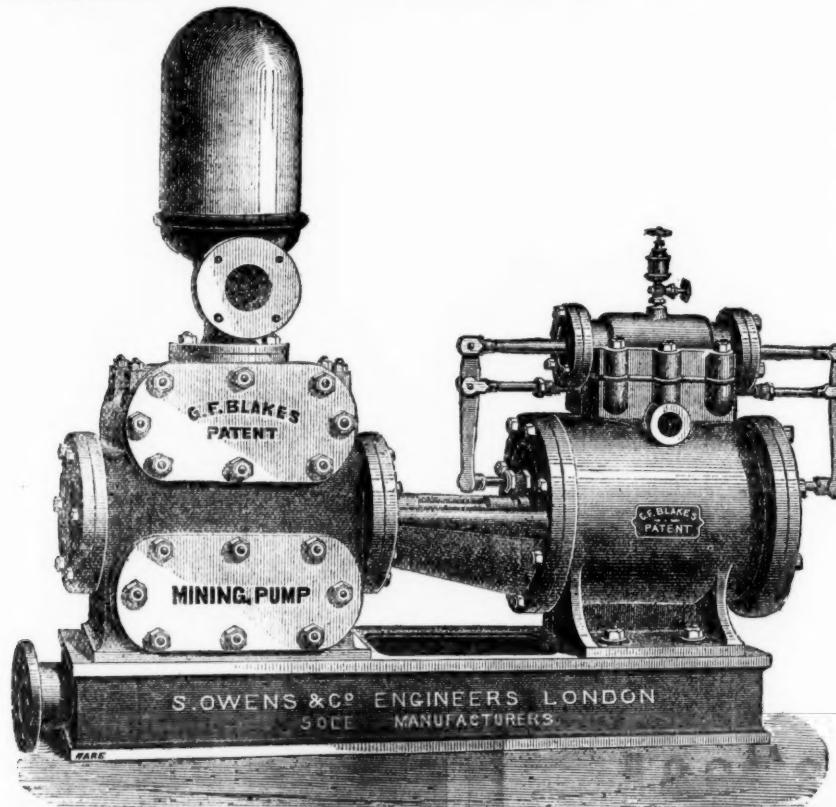
These PUMPS from their SIMPLICITY, RELIABILITY, DURABILITY, and ECONOMY are SPECIALLY SUITED FOR MINING PURPOSES, where large quantities of water require to be raised from great or medium depths with CERTAINTY. They are double-action in their construction, throwing a constant stream of water, can be made of any stroke to suit the space in which they have to work, can be arranged with any combination of steam and water cylinders to suit the pressure and lift against which it is desired to work them, are made of the very best materials and highest class of workmanship, and all working parts can be readily got at by any ordinary workman, and replaced if necessary by a duplicate part (all such being interchangeable) in the shortest possible time. For situations where gritty and sandy water has to be pumped the DOUBLE PLUNGER PATTERN is recommended. Where space is limited the PISTON PUMP is better suited, a novel feature of which is the PATENT REMOVEABLE LINING, which can be removed in a few minutes and substituted with a new one, without disturbing any other part of the pump.



Blake's Improved Double-plunger Steam Pump.

S. OWENS AND CO.,

In placing the BLAKE STEAM PUMP before the mining world, believe they are offering the BEST, MOST RELIABLE, and ECONOMICAL PUMP that has yet been made, and solicit an inspection of various sizes in operation at their works, Whitefriars-street, Fleet-street, London.



Blake's Improved Mining Pump, with Patent Removeable Lining to Pump Cylinder.

Any combination of these Pumps may be had to suit circumstances. The following are some of the SIZES SUITABLE FOR MINING PURPOSES:-

Dia. of steam cylinders, In.	12	12	12	12	14	14	14	16	16	16	16	18	18	18	18	20	20	20	20	24	24
Dia. of water cylinders, In.	3	4	5	6	4	5	6	4	5	6	8	4	5	6	8	5	7	8	9	6	8
Length of stroke	In.																				
No. of strokes per minute.	18	18	18	24	24	24	24	24	24	24	24	24	30	30	30	30	30	36	36	36	36
Quantity in gallons per hour, approximately ...	1440	2610	4200	5940	2940	4620	6600	2646	4158	5940	10620	2646	5160	7500	13260	4586	9000	12360	15660	6720	1200

PRICES FOR THE ABOVE, OR ANY SPECIAL SIZE, AND ILLUSTRATED CATALOGUES FURNISHED ON APPLICATION

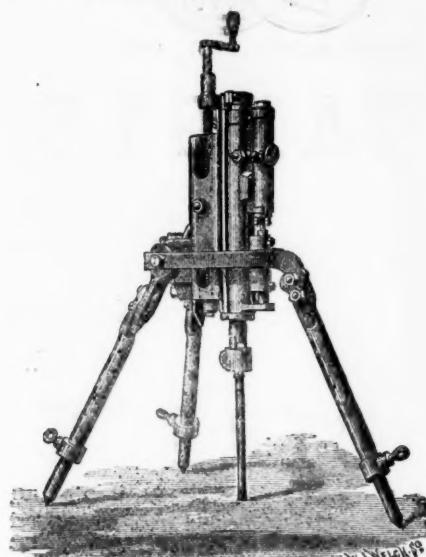
PATENT CONDENSORS

Can be supplied for any size pump to effect a saving of fully 30 per cent. in the consumption of fuel, greatly increasing their efficiency.

The Blake Pump will work under water, and as efficiently with compressed air as with steam.

BLAKE'S DONKEY PUMPS FOR FEEDING BOILERS KEPT IN STOCK.

THE "CHAMPION" ROCK BORER,
For Tunnels, Mines, Quarries
AND OTHER WORKS.



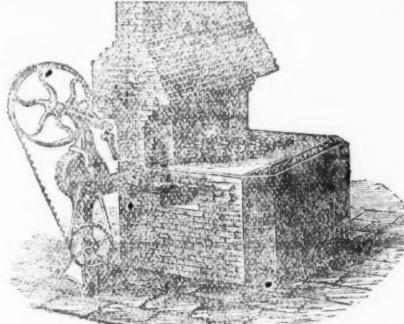
The "CHAMPION" Rock Borer has been designed after years of experience of other Rock Drills; it surpasses them in their good qualities, and avoids their imperfections, and while being of the very best make and material, it is absolutely the cheapest in the market.

Intending purchasers can satisfy themselves of the excellence of this Rock Borer by seeing it in actual operation.

Improved Air-Compressors, &c.

ULLATHORNE & CO.,
METROPOLITAN BUILDINGS,
68, QUEEN VICTORIA STREET, LONDON, E.C.

CYCLOPS PATENT BLOWERS.



SUITABLE FOR ANY ORDINARY SMITH'S HEARTH.

More powerful and more easily worked than bellows, take up very little room, and require little fixing. Worked by hand, treadle, or overhead pulley.

Price, complete £7.

May be seen in operation at the warehouse.

Also Keystone Portable FORGES,
With FAN BLAST, of various descriptions.

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And PAUL'S WHARF, LONDON.

SOLID DRAWN BRASS BOILER TUBES

FOR LOCOMOTIVE AND MARINE BOILERS,

EITHER

MUNTZ'S OR GREEN'S PROCESS
MUNTZ'S METAL COMPANY (LIMITED),
FRENCH WALLS,
NEAR BIRMINGHAM.

MINERS

PRICKERS AND STEMMERS

OF

MUNTZ'S METAL.

ACCORDING TO THE NEW MINES REGULATION ACT.

BEST KNOWN MATERIAL.

MUNTZ'S METAL COMPANY (LIMITED),
FRENCH WALLS,
NEAR BIRMINGHAM

WARSOP AND HILL,

HYDRAULIC AND GENERAL ENGINEERS.

SPECIALITIES.

PATENT PORTABLE POWER ROCK DRILLS.

IMPROVED

AIR COMPRESSORS AND STEAM ENGINES.

MINERS' PICKS, with interchangeable Steel Points.

Semi-portable and fixed Winding, Hauling, and Pumping Engines.

HYDRAULIC WINDING ENGINES.

MINING MACHINERY; PLANTS COMPLETE.

Full particulars, with prices and photographs, on application.

DEERING STREET, NOTTINGHAM



PARIS EXHIBITION, 1867.



VIENNA EXHIBITION, 1873.



LONDON EXHIBITION, 1874.



CORNWALL POLYTECHNIC SOCIETY, 1867 and 1873.

TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.,

AND BIRMINGHAM. (TANGYE BROTHERS), CORNWALL WORKS, SOHO,

FOR

"THE SPECIAL" DIRECT-ACTING STEAM PUMP.

Upwards of 12,000

OF

The "Special"
STEAM PUMPS

ARE IN USE IN

ENGLAND

And AMERICA.

200 SIZES

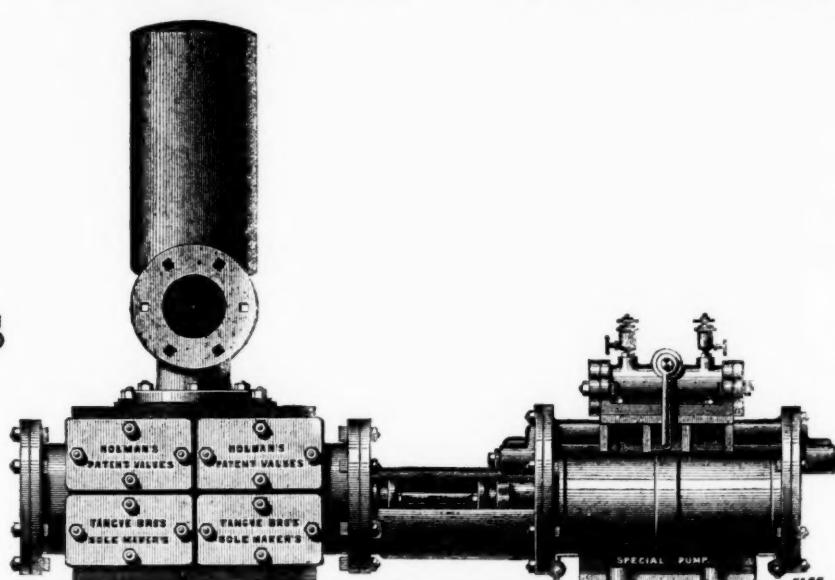
And combinations of

The "Special"

STEAM PUMPS

ARE NOW

MADE FOR EVERY VARIETY
OF PURPOSE.



GREAT REDUCTION IN PRICES.

The following sizes are suitable for low and medium lifts:—

Diameter of Steam Cylinder ...In.	3	4	4	4	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	8	8	9	9	9	9	9	10	10			
Diameter of Water Cylinder ...In.	1½	2	3	4	3	4	5	3	4	5	6	3	4	5	6	7	4	5	6	7	8	5	6	7	8	9	5	6			
Length of StrokeIn.	9	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	18	12	12	12	18	24	12	12			
Gallons per hour	680	815	1830	3250	1830	3250	5070	1830	3250	5070	7330	1830	3250	5070	7330	9750	3250	5070	7330	9750	13,000	5070	7330	9750	13,000	16,519	5070	7330			
Price	£ 18	18	20	25	22	10	27	10	32	10	25	30	35	40	30	35	40	45	50	40	45	50	55	65	50	55	60	70	85	55	60

CONTINUED.

Diameter of Steam Cylinder...In.	10	10	10	10	12	12	12	12	12	12	12	12	14	14	14	14	14	14	16	16	16	16	16	16	16	18	18	18	
Diameter of Water Cylinder...In.	7	8	9	10	6	7	8	9	10	12	12	12	12	12	12	12	12	12	12	14	10	12	14	9	10	12	14		
Length of StrokeIn.	12	18	24	24	18	18	18	18	18	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Gallons per hour	9750	13,000	16,519	20,000	7330	9750	13,000	16,519	20,000	30,000	9750	13,000	16,519	20,000	30,000	40,000	13,000	16,519	20,000	30,000	40,000	16,519	20,000	30,000	40,000	16,519	20,000	30,000	40,000
Price	£ 55	75	90	100	75	80	85	110	120	140	110	120	130	140	160	180	140	150	160	180	200	190	200	220	240	240	240	240	

Intending purchasers of Steam Pumps would do well to observe the great length of stroke, short steam cylinder, and short piston of the "Special" Steam Pump, as compared with the short stroke, long steam cylinder, and long piston of the Pumps of other makers, as the efficiency and durability of the machine, and the space occupied by same, greatly depend upon this. The advantage of long strokes will be obvious when purchasers are reminded that each set of suction and delivery valves of a "Special" Steam Pump with 24 in. stroke, running at 120 ft. per minute, would open and close only 30 times per minute, as against 120 times per minute in a Pump with only 6 in. stroke performing same duty.

The "Special" Steam Pump can be worked by Compressed Air as well as by Steam.

HUNDREDS of these PUMPS are USED for HIGH LIFTS IN MINES, for which purpose they are made with 21, 24, 26, 28, 30, and 32-inch Steam Cylinders, and 36 48 and 72-inch Strokes.

Holman's Patent Self-acting Exhaust Steam Condensers,

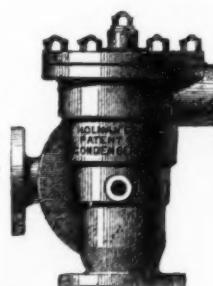
FOR ALL KINDS OF STEAM PUMPS AND HIGH-PRESSURE STEAM ENGINES.

TURNS WASTE STEAM INTO
GREAT POWER.

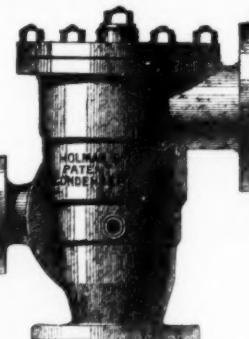
Saves 20 to 50 per Cent of Fuel.

QUIRES NO THREE-WAY COCKS,
CHECK, or REGULATING VALVES.

HOLMAN'S PATENT CONDENSER.



SAVES HALF ITS COST IN PIPES AND
CONNECTIONS.



PREVENTS ALL ESCAPE OF STEAM IN
MINES OR ELSEWHERE.



REQUIRES NO EXTRA SPACE.

The following Testimonial gives one Example of the Power Gained by the action of Holman's Patent Condensers:—

MORLEY COLLIERY, WIGAN, October 16th, 1874.

Messrs. TANGYE BROTHERS AND HOLMAN.

GENTLEMEN.—I have great pleasure in recording my entire satisfaction with the working of the Holman's Patent Steam Pump Condenser which you have supplied to us. The complete condensation of the steam is, apart from its value in the strict economic sense, a most valuable feature in the drainage of underground work-

ings. The perfect manner in which this important result is accomplished by your Condenser is extremely creditable to you, and merits the thanks and commendation of the Mining Engineer. When we start the "Special" Steam Pump the Condenser commences working automatically, and maintains a constant vacuum of 10½ lbs. per square inch, even when we run the Pump upwards of 80 strokes (16 feet) per minute. It may perhaps be interesting to you to know that when we were running the Pump at 84 strokes (168 feet) per minute, the steam gauge

indicating a steam pressure of 36 lbs. per square inch, 80 yards from the Pump, and the Condenser vacuum gauge on the exhaust pipe indicating a steady vacuum of 21½ inches, I turned the exhaust steam from the Condenser into the atmosphere, when the speed at once fell to 44 strokes per minute. The economy thus shown is really so great that the cost of the Condenser must be saved in a very short time. (Signed) J. THOMPSON.

Price from 30s. to 40s. per inch diameter of Steam Cylinder, according to the relative Diameter of Pump for which Condenser or is required.

NORTH OF ENGLAND HOUSE
SOUTH WALES HOUSE

TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.
TANGYE BROTHERS AND STHEL, Tredegar Place, NEWPORT, Mon.; and Oxford Buildings, SWANSEA.

GEORGE ANGUS AND COMPANY,
ST. JOHN'S LEATHER AND INDIA-RUBBER WORKS,
NEWCASTLE-UPON-TYNE.

Every description of Leather, India-rubber, and Gutta-percha for Engineering and General Mechanical purposes.

The ONLY PRIZE awarded for "FUEL ECONOMISERS" at the Vienna, Paris, and Moscow Exhibitions, was given to

GREEN'S PATENT FUEL ECONOMISER.

AN INDISPENSABLE APPENDAGE TO STEAM BOILERS.



MOSCOW, 1872.



VIENNA, 1873.

SAVES

20 to 25 per cent.
of Fuel.



PARIS, 1867.

EDWARD GREEN AND SON, Engineers and Sole Makers, 14, St. Ann's-square, Manchester.
ALSO LONDON, GLASGOW, DUSSELDORF, &c.—WORKS: WAKEFIELD.

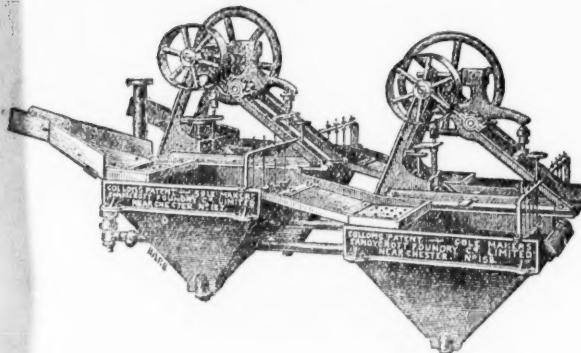
PATENT IMPROVED ORE WASHING & DRESSING MACHINES.

THE SANDYCROFT FOUNDRY & ENGINE WORKS CO. (LIMITED), N^o. CHESTER (ESTAB^D. 1838).

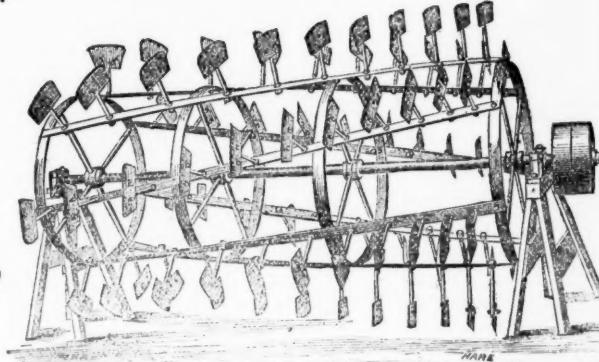
SOLE MAKERS IN GREAT BRITAIN.

HUNDREDS IN USE.

FULL PARTICULARS,
PHOTOGRAPHS, TESTIMONIALS, AND PRICES,
UPON APPLICATION.



MANUFACTURERS OF EVERY VARIETY OF
MINING MACHINERY.
PUMPING & WINDING ENGINES,
 PITWORK, CRUSHING MILLS,
 ROLLS OF PECULIARLY
 HARD AND TOUGH MIXTURE,
 &c., &c.



COLLOM'S PATENT AUTOMATIC ORE WASHING MACHINE, working at the following Mines:—Great Laxey, Cape Copper, Pontgibaud, Linares, Alamillos, West Tolgas, Lisburne, Minera Halvans, Snailbeach, Messrs. Vivian and Sons (Swansea), and many others.

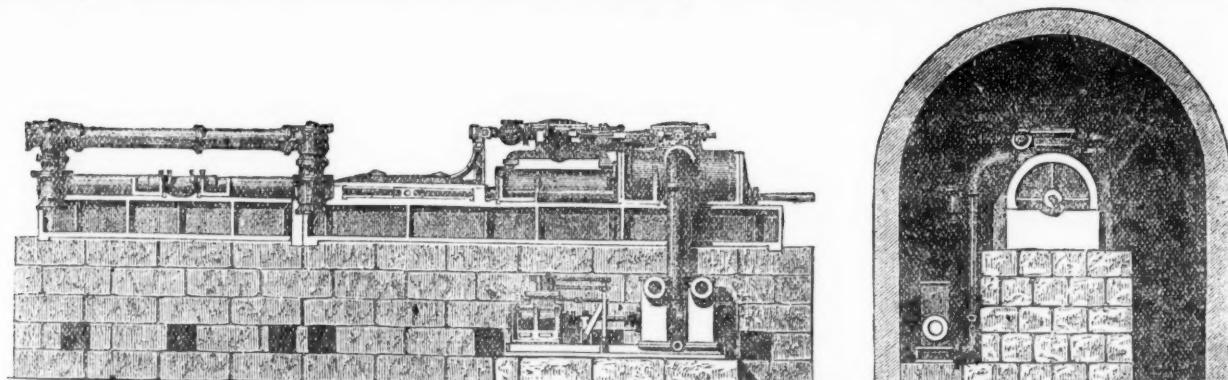
PATENT IMPELLER, OR KNIFE BUDDLE, in use at the following Mines:—The Van, Roman Gravels, Tankerville, Ladywell, Lisburne, East Black Craig, Old Treburret, Penhale and Barton, Bog, Linares, Fortuna, Alamillos, Minera Halvans, and many others.

LONDON OFFICE: 6, QUEEN STREET PLACE, E.C.

HATHORN, DAVIS, CAMPBELL, AND DAVEY,

MAKERS OF

The Differential Pumping Engine, Hydraulic Pumping Engines, Cornish Engines, Differential Blowing Engines, Compound Rotative Engines, the Separate Condenser, Hydraulic Machinery, Mining Plant of all kinds, and Machinery for Water Supply, Irrigation, &c.



DAVEY'S PATENT HYDRAULIC PUMPING ENGINE.

THE DIFFERENTIAL ENGINE SECURES GREAT ECONOMY AND RELIABILITY; IT IS IN EXTENSIVE USE, AND IS EMPLOYED IN PUMPING QUANTITIES OF 500 TO 700 GALLONS PER MINUTE, AGAINST COLUMNS OF 900 TO 1000 FEET IN HEIGHT, WITH REMARKABLE EASE AND FREEDOM FROM SHOCKS.

SUN FOUNDRY, LEEDS.

COAL-CUTTING MACHINERY.

W. and S. FIRTH undertake to CUT, economically, the hardest CANNEL, ANTHRACITE, SHALE, or ORDINARY COAL, ANY DEPTH, UP TO FIVE FEET.

Apply.—

16, YORK PLACE, LEEDS.

THE IRON AND COAL TRADES' REVIEW
 ROYAL EXCHANGE, MIDDLESBROUGH.
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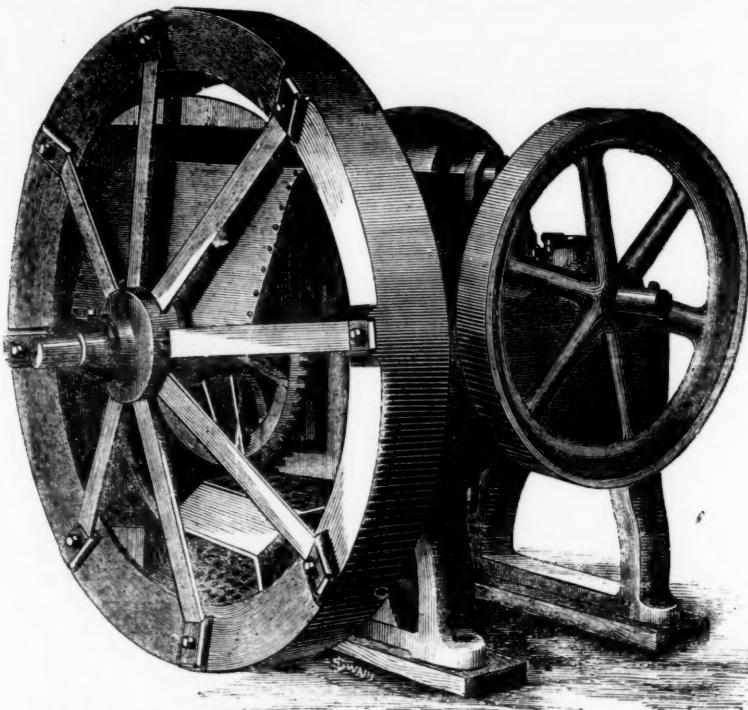
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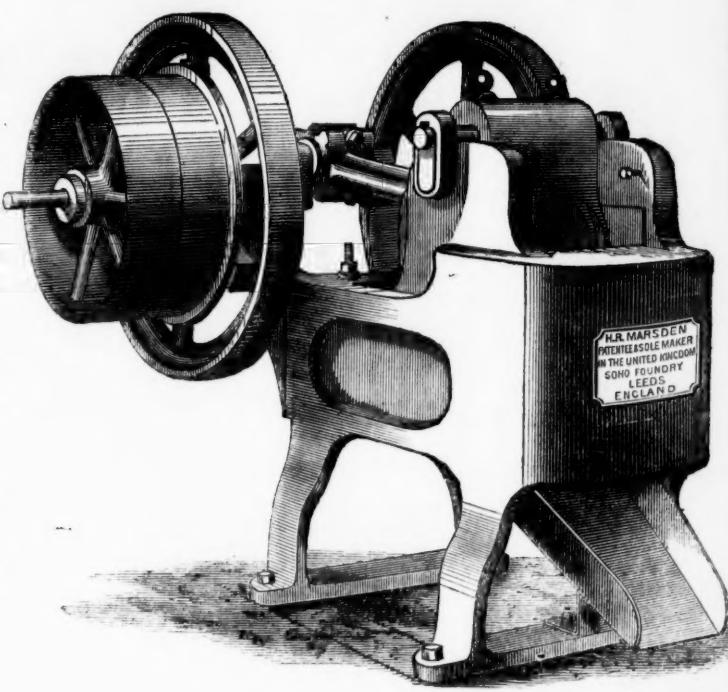


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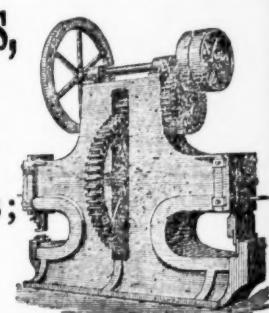
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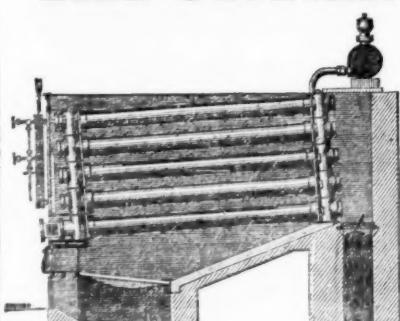


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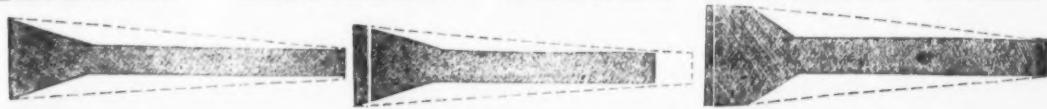
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